

This sub-thesis is my own work and all sources have been acknowledged.

THE AIR WAR IN THE GULF

Sub-thesis resubmitted by Phil Strickland in August 1993
for Master of Arts (Strategic Studies) in the Strategic and
Defence Studies Centre, Research School of Pacific Studies,

The Australian National University



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Phil Strickland

10 August 1993

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ACRONYMS

| | |
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| AAA | anti-aircraft artillery |
| ABCCC | Airborne Command and Control Center |
| AEW | Airborne Early Warning |
| ALCM | air-launched cruise missile |
| ATO | Air Tasking Order |
| AWACS | Airborne Warning And Control Systems |
| CAS/BAI | Close Air Support/Battlefield Air Interdiction |
| C ² | command and control |
| C ³ | command, control and communications |
| C ³ I | command, control, communications and intelligence |
| CCCIC | Coalition Coordination Communications and Integration Center |
| CENTCOM | United States Central Comand |
| CIA | Central Intelligence Agency |
| CINCENT | Commander-in-Chief Central Command |
| CJCS | Chairman of the Joint Chiefs of Staff |
| EW | electronic warfare |
| HARM | High Speed Anti-Radiation Missile |
| HAS | hardened aircraft shelter |
| IADS | Integrated Air Defence System |
| IAF | Iraqi Air Force |
| IFF | Identification Friend or Foe |
| JFACC | Joint Forces Air Component Commander |
| J-STARS | Joint Surveillance Target Attack Radar Systems |

| | |
|-------|---|
| JTIDS | Joint Tactical Information Distribution System |
| KTO | Kuwaiti Theatre of Operations |
| LGB | laser guided bomb |
| LOCs | lines of communication |
| NATO | North Atlantic Treaty Organisation |
| NBC | nuclear, biological and chemical |
| OPEC | Organisation of Petroleum Exporting Countries |
| PGM | precision-guided missile |
| RSAF | Royal Saudi Air Force |
| SAM | Surface to Air Missile |
| SEAD | Suppression of Enemy Air Defence |
| SOPs | Standard Operating Procedures |
| TACC | Tactical Air Command Center |
| TALD | Tactical Air Launched Decoy |
| TLAM | Tomahawk Land Attack Missile |
| UAE | United Arab Emirates |
| UN | United Nations |
| USAF | United States Air Force |
| USMC | United States Marine Corps |
| USN | US Navy |

OVERVIEW OF THE AIR WAR IN THE GULF AND INTRODUCTION

Iraq's invasion of Kuwait in August 1990 precipitated the first international crisis of the post-Cold War era, which led in its turn to the first major conflict of this period, the 1991 Gulf War. Between August 1990 and January 1991 the Iraqi leader, Saddam Hussein, defied the insistence of the international community, led by the United States, that the occupation of Kuwait would "not stand", in the words of the United States President, George Bush.

A multinational Coalition, acting under United Nations (UN) authority and directed by the United States Central Command (CENTCOM), commenced air strikes against Iraq on January 17 1991. The Coalition's very intensive air campaign, designated as Operation Desert Storm, continued until February 23 1991. This campaign was immediately followed by a ground assault (Operation Desert Sword) on February 24 which evicted the Iraqi Army from Kuwait and had placed Coalition forces deep inside Iraq when a cease-fire took effect on February 28.

Coalition aircraft flew a total of 109,876 sorties in the war, of which approximately 50 per cent were combat or strike missions. [1] Parallel operations were conducted against both Iraqi front-line forces and more deeply located strategic targets. [2] A particularly important strategic strike role was assigned to United States Air Force (USAF) F-117A stealth fighter bombers. CENTCOM's presentation of video-tapes of precision-guided missile (PGM) strikes helped create the impression of "an uneven match between a high-tech power..and a backward Third World army". [3]

It is difficult to cite a comparable imbalance between the respective lengths of discrete air and ground campaigns as

in the Gulf War. CENTCOM had based its planning on worst-case estimates of Iraqi capabilities. While these estimates were significantly lowered by January 17, CENTCOM still expected that its ground offensive would require 2 to 3 weeks, rather than its actual 4 days, to eject Iraqi forces from Kuwait.

The surprising rapidity of the Iraqi Army's collapse provided proof to many that the air campaign achieved a strategic yield at least commensurate with the effort expended on it. Further support was provided, even before Desert Sword commenced, by the increasing eagerness of very large numbers of Iraqi soldiers to desert or surrender. Prisoner of war interrogations indicated that the sustained bombing of Iraqi front-line forces had severely eroded their morale.

The 1990s had commenced with expectations that the end of the Cold War would foster a general easing of international tensions - Iraq in particular was expected by US intelligence agencies to remain quiescent in order to recover from the Iran-Iraq War of 1980-88. [4] The Gulf War demonstrated that conflicts stemming from regional disputes could emerge as rapidly, with the removal of superpower tensions, as in the past.

Once hostilities were joined, the Gulf War also showed that the destructive capabilities of modern weapons could produce a quick resolution of regional conflicts. However, the political constraints governing the Coalition's operations meant that this resolution was unlikely to be comprehensive, despite its overwhelming advantages in military force.

In evicting Iraq from Kuwait, the Coalition forces achieved all that the UN had authorised them to do and thus achieved the principal declared political objective of the United

States and its partners. However, this specific achievement fell short of an indirect but nevertheless explicit goal set out by President Bush before the ground offensive commenced - that "the Iraqi military and the Iraqi people ..[should] force Saddam Hussein..to step aside". [5]

While the Coalition possessed the military means to facilitate this outcome, such intervention was not a political possibility. The UN's authorisation for the use of force against Iraq was not interpreted by the Coalition as permission for a prolonged occupation of the country, perhaps the only certain way of destroying Saddam's regime. Most importantly, the sensitivities of America's Arab allies to the occupation of an Arab state by non-Muslims precluded serious consideration of this option.

Saddam's survival, despite the twin Shi'ite and Kurdish revolts against his regime in March 1991, and his continued irritation of the United States, therefore shows the political limits on what major powers can accomplish with military force. These limits were indeed advertised by President Bush's statement in April 1991 that the United States "never implied" that it would provide military support to the Iraqi people, if they chose to "take matters into their own hands". [6]

The discussion of Coalition air operations has grappled with two general issues - the historical question of their contribution to Iraq's defeat, and the more speculative set of questions relating to their implications for the future of armed conflict. Sibbald has observed that the initial support which the events of the Gulf War appeared to provide to the view "that airpower alone could win the conflict", now appears "significantly less clear". [7] Such historical

uncertainties are inevitably amplified in any attempt to distil the implications of the air war in the Gulf for future conflicts.

This thesis focuses on, firstly, the strategic effectiveness of the Coalition's air operations and secondly, the technological, doctrinal and command aspects of these operations and their contribution to this overall effectiveness.

Chapter 1 considers the issues raised to date by analysis of the Coalition air campaign, including the contrast between the contentions of the USAF and others, that the air campaign was a comprehensive success with far-reaching consequences for future military developments, with other assessments that diverge from these views.

The degree to which such analysis has probed the general issues of the air campaign's overall contribution to the Coalition victory, and the value of particular aspects of the air campaign to it, is explored in this chapter.

Chapter 2 details the events leading up to the Gulf War and the balance of forces between Iraq and the Coalition in mid-January 1991. While the causes of the war are not part of the central focus of this thesis, some discussion of them is necessary to explain why the United States in particular made an enormous, and expensive, military effort against Iraq.

This chapter also considers the historical and doctrinal influences on Coalition and Iraqi strategies. The Coalition and Iraqi command structures, and some of the operational issues that emerged in relation to them, are also discussed.

Chapter 3 details the sequence of air operations in the Gulf War. This chapter also develops on the focus of Chapter 1 and examines some of the contrasting views concerning particular aspects of the air campaign in further detail.

Chapter 4 presents the conclusions of the thesis.

NOTES

[1] L. Freedman & E. Karsh, The Gulf Conflict 1990-1991, London, 1993, p.303.

[2] G. Waters, Gulf Lesson One - The Value of Air Power: Doctrinal Lessons for Australia, Canberra, 1992, p.143

[3] Freedman & E. Karsh, op cit, p. 437.

[4] Ibid, p.27.

[5] Ibid, p.379.

[6] Ibid, p.421.

[7] R. Sibbald, in J. Pimlott and S. Badsey (eds), The Gulf War Assessed, London, 1992, p.106

CHAPTER 1 - EXISTING ANALYSIS OF THE AIR WAR IN THE GULF

A consideration of the conclusions drawn by institutional (individual armed service) and other commentary on the Gulf War is important to an analysis of the air campaign on at least two levels. Firstly, these conclusions represent the product of what is already a reasonably comprehensive base for analysis, given that the Gulf War is still recent, and given also the critical omission from most military analyses of a first-hand Iraqi perspective.

Secondly, whether by action or reaction, these views reflect to a considerable extent the dynamics of the institutional debate over the relative effectiveness of air, ground and naval forces (including naval aviation) in the war. Insofar as this debate influences future military developments, it is itself an important consequence of the Gulf War.

The significance of the Coalition air campaign is emphasised by the fundamental reasons why it has attracted such interest and debate. Foremost among these was the dominance of the United States, the one power that could reasonably claim to retain comprehensive superpower status in the early 1990s, in the Coalition's military operations.

The defeat of Iraq provided a fillip, however temporary, to American self-confidence following a period when analyses of the relative decline in American economic performance called into question the ability of the United States to maintain its international pre-eminence. The Gulf War was both the first major conflict that was not fought within an overarching context of Soviet-US rivalry, and what appeared to be the first clear-cut victory for United States armed forces over a significant opponent, since 1945.

The emergence of assessments that the performance of the Iraqi armed forces fell far short of the capabilities claimed for them by both sides, Saddam's survival against what appeared to be all the odds at the end of the war, and most recently the renewed US air and cruise missile strikes on Iraq in January and June 1993, have forced continuing revision of the conclusion that the Gulf War was brief and decisive. [1]

Moreover, many people, including some United States officials and individual USAF personnel, cautioned against drawing exaggerated lessons from the air campaign; it was also observed that its very success could stimulate reactions that might reduce the advantages of United States air power in a future conflict.

In March 1991, however, the apparent quick and decisive success of the air campaign underlay the claim that the United States' future military investments should emphasise its comparative advantage in air power.

This claim was vigorously expounded by the USAF even before the Gulf War began. Its Chief of Staff, General Michael Dugan, was dismissed in September 1990 after he claimed, *inter alia*, that a properly targeted strategic air campaign, that made Saddam Hussein "the focus of our efforts", would eliminate the need for ground operations other than in the secondary roles of "diversions, flanking attacks, and to block an Iraqi counter-strike". [2] Dugan's successor, General Merrill A. McPeak, stated in March 1991 that the Gulf War was "the first time in history that a field army has been defeated by air power". [3]

Two factors help explain the importance of the opportunity the Gulf War provided to the USAF (and other air forces) to vigorously proselytize the notion that air power had

achieved strategic primacy. The first concerns the doctrinal debate among Western military services over the strategic efficacy of air power that has continued for most of this century. The second was the prospect that the end of the Cold War would produce a much more restrained and competitive environment for budget allocations to individual armed services. [4]

Air power had achieved significant tactical and strategic successes before the Gulf War and, as CENTCOM recognised, the Middle East has historically been a favourable arena for the use of air power. However, these successes were overshadowed by the frustrations of air offensives in the Second World War and in the Korean and Vietnam wars. These frustrations generated a pervasive scepticism concerning the strategic value of air campaigns, especially strategic air campaigns conducted independently of ground operations.

The "enormous pool of data" which the Gulf War furnished has not resolved the much contested issue of the strategic potential of air power. [5] Thus, "Institutional arguments continue over whether the Coalition air forces fought a separate air campaign, or only air operations in a wider context and over whether Coalition strategy followed the [United States military] doctrine of AirLand Battle [which emphasised the integration of air and ground operations] or represented a refined form of independent strategic bombing, plus a largely unnecessary ground war". [6]

Most analysts acknowledge that the Coalition quickly translated its initial advantage in air power into a dominance over all aspects of air operations. This in turn greatly enhanced the Coalition's ability to control the subsequent sequence of operations - in particular to resist any temptation to launch a premature ground offensive, which

probably would have provided Iraq's only opportunity to inflict significant damage on the Coalition.

A base-line conclusion, held even by more sceptical analysts, is that it is "beyond doubt" that the "chronic [Iraqi] inferiority in airpower [demonstrated] a strategic liability for which it is almost impossible to compensate in regular conventional warfare". [7]

However, from this common point there is a wide divergence in consequent conclusions. Moreover, while individual services may have projected a consensus institutional view of the broader implications of the war, these views were not necessarily universal within them.

For instance, a USAF colonel, who served in the Gulf War, was quoted in a US Army publication as stating that "air power can only do so much, the Army must go in on the ground to..finally win the battle". [8] There has also been intense internal debate within the USAF over specific implications of the Gulf War including the "right mix" of stealth and non-stealth aircraft, and PGMs and unguided munitions, in future procurement policies. [9]

Equally, while many individual authors support some institutional conclusions, they have also made some significant departures from them. R.A. Mason wrote that the Gulf War "marked the apotheosis of twentieth century air power" and was thus likely to have significant implications for future conflicts. However, he cautioned that "no matter what lessons are extracted from the Gulf War, no-one knows who the next examiner will be". [10]

Gary Waters states that the Gulf War "may represent a telling indicator for the future" because the "pursuit of Iraqis fleeing from constant air attack and the acceptance

of final surrender could hardly be termed a ground war" [11] He also claims that, had the air campaign continued for another 10 days, the Iraqi Army "probably would have surrendered". [12] These conclusions are consistent with USAF views.

However, Waters also questioned the value of providing air support during the ground offensive when "Allied forces held obvious superiority on the ground". [13] This supports the concept of 'jointness' - the conduct of military operations so as to emphasise the strengths of individual services - rather than a theory of the strategic primacy of air power.

It would therefore be misleading to describe particular analyses of the air campaign as representing rigidly defined schools of thought; it is most useful to classify interpretations of the air war into groups of authors who have reached some broadly similar, but by no means uniform, conclusions.

The one significant general exception to this absence of uniformity are the more holistic claims of the individual services which, as noted, are at least partly influenced by a fiscally constrained environment.

Four groups of analyses can be identified by their conclusions relating to the overall decisiveness of the air campaign and by their comments on more specific aspects of it.

These groups include, firstly, those authors who subscribe to the USAF view that the air campaign was comprehensively successful and far-reaching. Richard P. Hallion's statement that "air power has clearly proven its ability not merely to be decisive in war - but to be the determinant of victory in war" is representative of the ambitious conclusion of this

group that Coalition air operations demonstrated a revolution in the conduct of war. [14]

The conclusions of a second group of authors, including Mason and Waters, are very similar. These authors acknowledge the decisiveness of the air campaign within the unique context of the Gulf War, and conclude it showed that air power is likely to significantly influence most future conflicts. However, they are more cautious concerning the effectiveness of air power in specific future contingencies.

These authors emphasise how the Coalition was uniquely advantaged by factors such as the isolation of Iraq from international support, and by the desert conditions of most of the Kuwaiti Theatre of Operations (KTO) - Kuwait and south-eastern Iraq, which provided a favourable arena for air operations. They emphasise that such advantages would not exist if international support for military action was weaker than in the Gulf War, or if air power was used in less favourable terrain, or indeed if a future opponent conducted vigorous defensive counter-air operations.

Some US officials shared this caution. Frank Kendall, in 1991 the US under-secretary of defense for tactical warfare programs, stated that the implications of the Gulf War were limited because the Coalition did not defeat a well-prepared force in "a dynamic environment". [15]

An interesting variation on the theme of the decisiveness of air power was developed by Mohamed Heikal. He stated that "the idea that a third world country could absorb and withstand an intensive aerial bombardment by a superpower" [disintegrated] "in the first minutes of Operation Desert Storm", and that Coalition ground forces finished "a task..almost entirely achieved by Coalition air power". [16]

In strategic terms, Heikal's conclusion could have been written by Generals Dugan or McPeak. However, it represents the outcome of a very different approach to theirs; it is conditioned by the view that Western powers have exploited Arab political divisions throughout this century, and that the use of modern air power is the latest means of continuing this exploitation.

A third group has emerged, to a significant extent in reaction to USAF claims, which has sharply questioned the value of attacks on Iraqi economic and other strategic targets, while affirming the decisive value of air strikes against front-line Iraqi Army units.

This view supports the US Navy (USN) and US Army views that the primary focus of air operations should be on an opponent's forces in the field. William Arkin, the only analyst of the air campaign who has so far been permitted to conduct investigations in Iraq, concluded that the strategic phases of the air campaign were "effective, efficient, legal and largely unnecessary" because the decisive blows of the war were accomplished through the tactical bombing of Iraqi forces. [17]

Arkin's views have been supported by Freedman and Karsh, who conclude that "the aspects of [the USAF's] campaign most directed against Iraq's economic and political structure [were] least relevant to the ultimate victory". [18]

The Coalition's air campaign was governed by a wider strategy which sought to successfully conclude the war as soon as possible. In this context Freedman and Karsh have supported Arkin's assessment that the broader strategic justification for the scale of the air attacks on some Iraqi strategic targets, such as electrical power production and oil production facilities, was weak. They acknowledge these

attacks efficiently destroyed many of these facilities, but consider that this was unlikely to have a meaningful strategic effect in a short war. [19]

In reply to Arkin's critique, USAF personnel involved in the target selection process acknowledged the importance of B-52 strikes, in particular, in breaking the Iraqi Army's will, but they rejected the notion that attacks on Iraqi oil, electricity and transportation did not affect the outcome of the war. [20]

Arkin's view are themselves not completely consistent. Given his view that strategic strikes were largely "irrelevant", his comments on another strategic target set are interesting. He faults strikes on Iraqi command, control and communications (C³) facilities because, firstly, many were allegedly targeted against facilities from which vital electronic equipment had been removed, in anticipation of attacks. [21] Arkin's criticism of these attacks is therefore concerned more with their effectiveness than the relevance of the targets themselves. (See also p.70)

Secondly, Arkin claims that poor co-ordination between the US State Department and USAF target planners prevented the State Department's opinion, that it would not be an illegal act if Saddam Hussein was killed as a by-product of attacks on Iraqi command facilities, from being communicated to target planners until late in the war. (USAF planners were constrained by an Executive Order in force since 1976 which prohibits assassination attempts on foreign leaders by US agencies). Arkin considers that, while a strike on Saddam had "some hope of success" early in the war, by the time such strikes were mounted he could not be traced. [22]

It is therefore ironic, given Arkin's focus on the 'irrelevance' of strategic strikes, that on this issue his

analysis converges with General Dugan's view that a strategic air campaign with a personal focus on Saddam provided the best prospect of early victory.

A fourth group acknowledges the importance of the air campaign but considers that the decisive operation of the war was the ground assault on Iraqi forces. Pimlott and Badsey have concluded that the USAF claim "that airpower alone defeated the Iraqi Army..has not withstood even brief examination". [23]

Some of the contrasting views of these four groups can be illustrated by their conclusions regarding two issues: the relative strategic effectiveness of land-based and carrier-based aviation and the contribution of advanced technology to Coalition air operations.

The focus of institutional arguments on the first issue is a very interesting development. A traditional claim advanced by proponents of air power argued that a properly constituted strategic air campaign would eliminate the need for a major effort by ground forces. [24] As noted, this argument was reiterated before and since the Gulf War. Such claims are not surprising; what is more significant is that they have not constituted the 'main game' for institutional players in the debate over the implications of the air war.

General McPeak's claim that air power won the Gulf War might have been expected to set in train a fierce institutional argument between the US Army and the USAF. Instead, based on their Gulf War experiences, these two services were able to quietly come to an agreement in September 1991 which more carefully defined the role of each in a future battlefield (and which changed the name of the AirLand Battle Doctrine to AirLand Operations). [25]

By contrast, the debate between the USAF and the USN over the effectiveness of aircraft carrier strikes has been very intense. This debate appears mutually reinforced by the direct competition between the two services for budget appropriations for military aviation, their very deep doctrinal differences concerning the use of air power, and operational difficulties which emerged during the war itself (see p.39).

Jeffrey Record wrote that the Gulf War has advertised "the limits of sea-based air power" - including "its exorbitant cost...comparatively short range and lack of cumulative and sustained punch". [26] Hallion claims that aircraft carriers do not project long-range power "very well" and that a reassessment of their role "in long-range strikes against deeply located land targets".."is long overdue". [27]

Against this, probably the most crucial argument in support of the effectiveness of carrier strikes is based on the important statistic that USN aircraft "carried out at least 60 per cent of the operations to suppress Iraqi air defences". [28] Given the quick success and importance of these operations (see p.66), criticisms of the strategic effectiveness of naval aviation in the Gulf War appear much harder to justify.

This does not in itself counter the argument that the same "punch" could have been delivered for less cost had some of the money spent on carrier battle groups been available for additional investments in land-based air power. However, Pimlott and Badsey conclude that, with the end of the Cold War, "United States and European NATO thinking has turned increasingly to power projection and improvised overseas deployments". [29]

Such deployments could necessarily mean forgoing a comparable advantage to the well-developed infrastructure which greatly assisted USAF operations from Saudi Arabia in the Gulf War, and could thus increase the importance of carriers. These deployments could "give naval forces an enhanced importance and role" and "the quiet success of the US Navy and its Coalition partners" - in public relations terms, the USN performed poorly compared with the USAF and the US Army in the Gulf War - "could well be one of lasting importance". [30]

The question of the value of high technology to the success of the Coalition air campaign is not straightforward, and some of the problems of definition it raises can be illustrated by three issues.

Firstly, the definition of a high technological air asset poses difficulties in that this concept is variable in respect of particular air assets. In the case of older aircraft such as the B-52, for instance, the measure of its high technological capabilities is a function not only of their age but also their adaptiveness to system upgrades which extend service life and effectiveness.

One US official said that the Gulf War demonstrated the premium importance of PGMs and showed that unguided, "dumb" bombs were "just that". [31] However, the B-52s which delivered most of these dumb bombs incorporated such high technological features as advanced satellite-linked navigation systems and avionics that permitted more accurate bomb delivery. [32] It is therefore difficult to regard their missions as a low-technology proposition or, given their generally acknowledged effectiveness against Iraqi front-line forces, as strategically misconceived.

Secondly, advanced technology is an integral component of most modern air forces, and modern military forces generally. Despite their clear technological advantages, the United States and its partners did not encounter a technologically backward opponent in Iraq. However, as discussed in Chapter 2, there were important qualitative differences in the ability of Coalition and Iraqi forces to effectively absorb the full potential of the military technology available to them.

Thirdly, the use of some technologies in the Gulf War was so limited that it is difficult to draw substantive conclusions as to their strategic effectiveness. Gary Waters has suggested that the 12 Tomahawk Land Attack (cruise) Missiles (TLAMs) launched from USN submarines were used "more to demonstrate the capability than anything else". [33] Conceivably, a similar inference could be drawn from the one occasion when air-launched cruise missiles (ALCMs) were used (see p.64).

The Gulf War marked the first significant combat test for an array of aircraft and combat systems. As well as cruise missiles, these included stealthy aircraft and a variety of munitions and missiles. The natural interest in the apparent novelty of this technology - much of it, including the F-117s, was actually mature technology - contributed to the apparent, and in some ways exaggerated, prominence of high technology in the air campaign.

CENTCOM had planned an extended air campaign to exploit its advantages in air power over the Iraqi Army, which "while not quiet the fourth largest army in the world as the Pentagon described it", was nevertheless a substantial force. [34] 1,010 Coalition personnel were killed and wounded compared with estimates of between 10,000 and 100,000 Iraqis killed in the war. [35] The results of the

air campaign, particularly this disproportionate ratio, appeared to place modern, high-technology air power squarely within a central tradition of American military doctrine of maximising the use of technology and firepower to minimise American casualties. [36]

Following from this, the most ambitious claims for the value of high technological air assets are intermeshed with the most ambitious claims for the air campaign itself - that it showed that modern technology had 'caught up' with predictions dating back to the First World War that air power could "decide wars on its own". [37]

There has, however, been extensive questioning of some official performance indicators of Coalition air operations, including revisions of the 'kill rates' of individual weapons. For instance, *The Washington Post* claimed in April 1992 that the 90 per cent success rate claimed for laser guided bombs (LGBs) delivered by F-117As was actually closer to 60 per cent. [38]

Other assessments have questioned initial claims concerning the performance of particular aircraft, such as the ability of F-117As to evade Iraqi radar early in the war without the support of electronic warfare aircraft.

Such revisions have emerged in parallel to the arguments of Arkin and others that no matter how well particular assets performed in the Gulf War, the rationale for acquiring succeeding generations of them is weakened if they were used in operations which had a negligible strategic effect. Arkin has challenged the USAF claim that the Gulf War demonstrated the need for increasingly expensive investments in technologically advanced aircraft which can "do a triple somersault but can't carry the massive amount of bombs you need to win a war". [39]

Existing analysis of the Gulf War has furnished a wealth of material on the preceding issues. However, the most critical gap in our understanding of this conflict is the absence of an Iraqi perspective which, among other matters, can illuminate the decision-making processes of the Iraqi command structure.

The general nature of Iraq's highly centralised and, under Saddam, highly personalised command structure is understood. However, there have clearly been no 'insider' Iraqi accounts to complement those describing the deliberations of United States' command authorities - although Heikal presents undocumented claims concerning details of some key Iraqi decisions.

This gap has helped to focus most discussion of the military aspects of the Gulf War on issues related to the experience and strategic interests of Coalition participants. While this focus is legitimate - the Coalition was undeniably more active than Iraq - there are valuable defensive lessons in some Iraqi operations (see Chapter 3).

The scarcity of Iraqi sources does not mean that analysis of Iraqi actions is impossible, but it is likely to be incomplete. For instance, there are identifiable factors, including the superiority of force held by the Coalition, and the relatively poor morale and combat training of Iraqi air crews, which provide credible explanations for the Iraqi Air Force's poor performance in the war. However, these alone do not completely explain either this general failure or specific Iraqi actions.

For instance, a variety of theories have been advanced to explain why, early in the war, many of Iraq's more capable aircraft were flown to Iraq's recent enemy, Iran. (To

Freedman and Karsh this was an "act of panic" by Saddam; according to Heikal it was a reasoned decision based on a calculation of the risks involved in 'flight or fight').

[40]

While many of the explanations for this and other Iraqi decisions are highly plausible, they will remain speculative until an authoritative explanation from the Iraqi side is made.

NOTES

Abbreviation: AWST = Aviation Week & Space Technology

[1] Pimlott & Badsey, op cit, p.273.

[2] R. Woodward, The Commanders, New York, 1991, p.291.

[3] R.S. Dudney, 'McPeak on the war', Air Force Magazine, Arlington (Va.), May 1991, p.21.

[4] Pimlott & Badsey, op cit, p.262.

[5] Waters, op cit, p.9.

[6] Pimlott & Badsey, op cit, p.272

[7] Freedman & Karsh, op cit, p.437

[8] R. Sibbald, in Pimlott & Badsey, op cit, p.123

[9] 'Flexibility of attack aircraft crucial to crushing Iraq's military machine', AWST, 22/4/91, New York, pp.46-47.

[10] R.A. Mason, 'The air war in the Gulf', Survival, London, May/June 1991, p.225.

[11] Waters, op cit, p.284.

[12] Ibid, p.205.

[13] Ibid, p.28.

[14] R.P. Hallion, Storm over Iraq: Air Power and the Gulf War, Washington, 1992, p.264.

[15] J.D. Morrocco, 'War will reshape doctrine, but lessons are limited', AWST, 22/4/91, New York, p.42.

- [16] M. Heikal, Illusions of Triumph: An Arab View of the Gulf War, London, 1992, p.377 & p.386.
- [17] 'Tactical Bombing of Iraqi Forces Outstripped Value of Strategic Hits, Analyst Contends', AWST, New York, 27/1/92, p.62.
- [18] Freedman & Karsh, op cit, p.437.
- [19] Ibid, p.321.
- [20] 'Strategic Campaign Focused on Targets and Cut Casualties, Pentagon Maintains, AWST, New York, 27/1/92, p.65
- [21] 'Tactical Bombing of Iraqi Forces Outstripped Value of Strategic Hits, Analyst Contends', AWST, New York, 27/1/92, p.62.
- [22] Ibid, p.63.
- [23] Pimlott & Badsey, op cit, p.272.
- [24] Freedman & Karsh, op cit, p.314
- [25] Pimlott & Badsey, op cit, p.272.
- [26] J. Record, 'Why the Air War Worked', Armed Forces Journal International, Washington, April 1991, p.145.
- [27] Hallion, op cit, p.265.
- [28] A. Lambert, in Pimlott & Badsey, op cit, p.136.
- [29] Ibid, p.272.
- [30] Ibid, pp.272-273.
- [31] J.D. Morrocco , 'Looming budget cuts threaten future of key high-tech weapons', AWST, New York, 22/4/91, p.66.
- [32] Waters, op cit, pp.43-44.

[33] Ibid, p.49.

[34] Freedman & Karsh, op cit, p.279.

[35] Ibid, pp.408-409; Waters, op cit, p.100.

[36] S. Badsey, in Pimlott & Badsey, op cit, p.60.

[37] Freedman & Karsh, op cit, p.314.

[38] P. Clark, 'War's enduring memento may be the credibility gulf',
Sydney Morning Herald, Sydney, 20/5/92.

[39] 'Tactical Bombing of Iraqi Forces Outstripped Value of
Strategic Hits, Analyst Contends', AWST, New York, 27/1/92,
p.62.

[40] Freedman & Karsh, op cit, p.305; Heikal, op cit, pp.388-389.

CHAPTER 2 - BALANCE OF FORCES

Iraq ended its war with Iran notionally victorious, but with a severely disrupted economy. Iraq began the war with a \$35 billion surplus in its balance of payments; it ended it with an \$80 billion deficit. [1] Iraqi economic weakness was dangerously coupled to a military establishment which by 1989 was "the most formidable" in the Arab world. [2] This combination maximised both the temptation for, and the pressure on, Saddam to resolve his domestic difficulties by military means.

Saddam's declared differences with Kuwait in 1990 centred on the price of oil. Even some unsympathetic observers acknowledge there was "some justification" in Saddam's claim that Kuwait and the United Arab Emirates (UAE), by exceeding their oil production quotas set by the Organisation of Petroleum Exporting Countries (OPEC), had depressed oil prices. [3]

The increase in international consumption this fall produced disproportionately benefited more developed petroleum exporters such as Kuwait which had greater investment in oil refinement and distribution. The price fall impacted adversely on Iraq with its much greater dependence on crude oil export.

Despite these differences, and the parallel deterioration in Iraqi-US relations, Iraq's invasion of Kuwait was largely unexpected. US Army General H. Norman Schwarzkopf, CENTCOM's Commander-in-Chief, predicted that any Iraqi incursion into Kuwait would be limited. [4] The Kuwaiti armed forces were placed on alert in mid-July but were stood-down immediately before the invasion to avoid provoking Saddam.

It appeared unthinkable to most Arab leaders before August 1990 that an Arab nation would invade a 'brother' Arab state; their consequent shock underlay their support for the United States' actions against Iraq. However, President Bush's achievement in assembling the Coalition against Iraq was a profound reversal of recent US policy.

United States' support for Iraq in the Iran-Iraq War was pre-conditioned by the Iranian Revolution of 1978-79, in which the Shah of Iran, one of America's most staunch allies, was deposed by the vehemently anti-American regime of the Ayatollah Khomeini. A related but even more important influence on American attitudes was the seizure of US embassy staff in Tehran in November 1979 by pro-Khomeini students, and their subsequent detention until January 1981.

Throughout the 1980s Iran was "an obsession for decision-makers in Washington. Hence if Iraq could keep Iran in check that..was a cause for commendation". [5] In 1984 the Reagan Administration removed Iraq from its list of 'terrorist states' and added Iran. By 1990 the United States had extended agricultural credits worth \$1 billion to Iraq. US military satellite data was made available to Iraq and the United States also acquiesced in the supply of US arms to Iraq from legitimate clients. [6]

The major departure from this policy was the Iran-Contra affair of 1985, when officials in the Reagan Administration conspired to supply Iran arms, via Israel, for funds ultimately used to support the US-backed Contra rebels in Nicaragua. However, the desire to control the potential damage of this incident contributed to the Reagan Administration's agreement to a request from Kuwait - then an Iraqi ally - to re-flag Kuwaiti oil tankers and protect them against Iranian attacks in Operation Earnest Will between July 1987 and August 1988. [7]

After Iranian mines disabled a US frigate, a United States retaliatory strike in April 1988 sunk "a considerable portion of the Iranian navy". [8] This operation co-incided with major Iraqi offensives and added to the pressures on Iran to seek a cease-fire.

By 1990 serious strains had emerged between Iraq and the United States. At issue was Saddam's threat to strike Israel with chemical weapons, should Israel repeat its 1981 strike on Iraqi nuclear facilities, and the detection of Iraqi efforts to illegally import nuclear weapons components by American and British authorities. However, these incidents had not fatally ruptured Iraqi-US relations and in July 1990 the United States was still seeking better relations with Baghdad.

The occupation of Kuwait was completed within 48 hours of the Iraqi invasion on August 2 1990. However, the timing of Saddam's *demarche* proved unfortunate for Iraq. The invasion deeply offended the "moral framework" of President Bush, which was predicated on respect for the norms of international law and behaviour. (Bush could accept Saddam's pre-war oppression of Iraqi Kurds; he could not tolerate Iraqi atrocities in Kuwait following the invasion). [9]

Les Aspin, then Chairman of the House of Representatives Armed Services Committee, succinctly expressed US concerns in the Gulf Crisis as "oil, aggression and nukes". [10] By invading Kuwait, Saddam had acquired control over 15 per cent of the world's known oil reserves; in August 1990 Saudi Arabia, which held a further 20 per cent of these reserves, also appeared vulnerable to Iraq.

In 1990 one US intelligence assessment estimated that Iraq's nuclear research program could produce weapons by 1995. [11] United States' concerns about this incipient capability were aggravated by Iraq's recent efforts to illegally expedite its nuclear program. Iraqi scientists who defected after the Gulf War indicated that Iraq was actually ahead of this forecast and had planned "to complete a bomb by the end of 1991". [12]

To most countries Iraq's invasion of Kuwait was a very clear-cut, even anachronistic, case of aggression. This, combined with incidents such as Saddam's attempts to exploit foreign hostages meant that the case against him was in many ways self-evident.

The United States was able to exploit circumstances such as its vastly improved relations with the Soviet Union, and its manageable relations with China resulting from President Bush's modest reaction to the Tiananmen Square massacre in 1989, to quickly translate the near universal condemnation of the invasion into direct action against Iraq.

Between August and November 1990 the Bush Administration's focus shifted from crisis management through political, economic and diplomatic pressure on Saddam, to a preparation for crisis resolution through direct military action. [13] US diplomatic efforts culminated in UN Security Council Resolution 678 of 29 November which demanded Iraq's unconditional withdrawal from Kuwait by 15 January 1991, and authorised "the use of all necessary means" to enforce it.

The rapid evaporation of Cold War tensions is illustrated by the collaboration of the Soviet Union against a state which had until recently been its most important Middle Eastern client. The wording of Resolution 678 was finally determined between the Soviet Foreign Minister Eduard

Shevardnadze and US Secretary of State James Baker. [14] Soviet participation helped make possible a legal framework for international military actions, led by the Soviets' recent Cold War adversary, against their recent mutual client.

The military balance between the Coalition and Iraq in mid-January 1991 was defined not only by the raw numbers of each side's personnel and equipment, but also by the effectiveness of their respective command and control (C²) arrangements, the relevance of their operational doctrine and recent military experience to the strategic circumstances of the imminent conflict, and indeed by how well such lessons had been absorbed.

The strategies of the two sides also reflected their contrasting political objectives and vulnerabilities. The Coalition held the advantage over Iraq in most military capabilities. However, the Coalition had a major potential vulnerability in relation to Saddam's declared intention of involving Israel in the imminent conflict at the earliest opportunity.

In effect, the tension between the United States' need to maintain the commitment of its Arab partners to the Coalition, while simultaneously preserving its traditional commitment to the security of Israel, amplified the, at best, modest strategic potential of Iraq's intermediate-range Scud (SS-10) missiles.

The military effect of the Scuds was compared by an Israeli official to a flying dustbin: "if they hit you on the head its very nasty, but otherwise its a load of rubbish". [15] The Scuds had a circular error probable of approximately 2km

under optimum conditions; however, despite this limited effectiveness, Iraqi Scud strikes very nearly brought Israel into the war in the first days of the conflict.

Even Syria, Israel's most inveterate adversary since 1948, may have tolerated some kind of Israeli counter-strike on Iraq and remained in the Coalition. However, any Israeli intervention had unpredictable implications, not least of which was the possibility of Israeli nuclear retaliation should Iraq use chemical weapons. [16] The suppression of Scud strikes therefore required a disproportionate effort which for a time reduced the number of air strikes on other targets. [17]

The Coalition's political vulnerability was an important factor underlying the United States' objective of successfully concluding the Gulf War as soon as possible with minimum loss. Another factor related to the lessons learned from the failure of United States' intervention in the Vietnam War between 1961 and 1973.

Among these lessons were, firstly, the perception that domestic support for military action against Iraq would quickly erode if high casualties were sustained. This was a view shared by Saddam, but one which possibly misread history. Majority support for US intervention in Vietnam existed as late as 1968; thereafter disenchantment with the war was probably less a matter of its cost and more a matter of it being perceived as unwinnable. [18]

Secondly, it was considered that attempts to send political signals through the incremental and selective use of force would fail; as would attempts to micro-manage the war through the political selection or exclusion of targets, as with the exemption of Hanoi and Haiphong from target lists for extended periods in the Vietnam War.

Thirdly, the effectiveness of air operations in Vietnam was perceived to have been hampered not only by frequent pauses but also by segregated service command arrangements leading to separate, un-coordinated air campaigns. [19]

The specific outcomes of these lessons in the Gulf War included, firstly, the extension of the air campaign for as long as possible to minimise Coalition casualties in a ground attack. Moreover, although most senior US commanders considered that a ground campaign would be necessary, they "saw no need..to preclude the possibility of the air campaign doing the trick". [20]

Secondly, General Colin Powell, the Chairman of the Joint Chiefs of Staff (CJCS), advised Bush early in the Gulf Crisis on "the major lesson of Vietnam", to use military force with maximum and constant impact. [21]

The rejection of the notion of civilian 'micro-management' of air target lists was emphasised by the lateness of the briefing (January 14 1991) provided by General Powell to the Secretary of Defense, Dick Cheney, on the detailed target set. (Cheney ordered some minor revisions to it). President Bush was "not informed of the detailed target list". [22]

Thirdly, although 37 different countries, and 11 national air forces, were represented in the Coalition, the principle of unified command was preserved through overall operational command residing with CENTCOM, as discussed below.

Finally, the efforts at reinvigorating the American military after Vietnam produced the doctrine of AirLand Battle, which was promulgated as a joint US Army-USAF doctrine in 1984.

The Doctrine was based on using American advantages in technology and firepower "to win" a war. [23]

AirLand Battle was intended to be a "global warfighting doctrine" adaptable to any conflict. [24] However, the doctrine would appear most applicable where geographic and other conditions permitted operations to be mounted from the 'forward edge of battle' to an opponent's rear areas and higher headquarters - such as in the KTO and Iraq.

On August 8 1990 President Bush announced the deployment of US air and ground forces to Saudi Arabia to deter any further Iraqi aggression. The first US forces to arrive in Saudi Arabia were two squadrons of F-15 fighters on August 7 (local time). Bush's announcement followed a mission by Secretary Cheney to Saudi Arabia. Cheney presented satellite imagery detailing the offensive posture of Iraqi forces on the Saudi-Kuwaiti border. This convinced King Fahd to invite foreign forces into his kingdom - a highly sensitive decision given the deep Islamic conservatism of Saudi society. [25]

While "the exact sequence of events..remains unclear", in late October 1990 President Bush authorised a doubling of both US ground forces and combat aircraft deployed to the Gulf theatre. [26] This increase would later permit CENTCOM to conduct parallel attacks on Iraqi fielded forces and strategic targets.

The announcement of these additional commitments was delayed until 8 November 1990 - two days after the US Congressional elections and 3 weeks before the UN authorised the use of force against Iraq. President Bush declared that the additional forces would provide an "adequate offensive military option, should that become necessary..".

Coalition Command and Control

By February 1991 the United States had deployed 527,000 military personnel out of a Coalition total of over 700,000, 1,990 aircraft out of a final total of at least 2,614 aircraft, and 2,000 out of 3,500 tanks. This predominance required and assured the exercise of operational command over Coalition forces by CENTCOM, the unified (joint service) command responsible for US military operations in south-west Asia and most of the Middle East. [27]

The 1986 US Goldwater-Nichols Act "placed full command of all forces in the field in the hands of the respective field commander", subordinate to the CJCS. [28] General Schwarzkopf, as the Commander-in-Chief Central Command (CINCENT), held theatre-wide responsibility over the development of operational plans and their execution. The United States' Coalition partners exercised full national command over their forces and maintained "the communications necessary to direct these forces for national purposes". [29] However, CENTCOM exercised operational command over these forces.

The difficult task of reconciling these two potentially conflicting command concepts was accomplished by the formation of a Coalition Coordination Communications and Integration Center (CCCIC) to integrate separate lines of national command and, as far as possible, by devolution of tasks to national forces, and individual US services, consistent with their capabilities. [30]

This devolution reduced problems of interoperability between different national forces, as did the establishment of Standard Operating Procedures (SOPs) between the national air forces. [31] The Coalition also benefited from the familiarity established among its NATO members with each

others operational procedures and the commonality established between the USAF and the Royal Saudi Air Force (RSAF).

General Khalid Ibn Sultan of Saudi Arabia commanded Saudi forces and exercised operational control over participating Muslim forces. Schwarzkopf's subordinate, USAF Lieutenant General Charles A. Horner, was appointed Joint Forces Air Component Commander (JFACC) with command over all Coalition air forces. Horner's headquarters was located in the USAF Tactical Air Command Center (TACC) in Riyadh, which co-ordinated the operations of the various national air forces.

The TACC developed a single Air Tasking Order (ATO) which, in the earlier part of the air war when targets were mostly known and generally fixed, assigned targets on a daily basis to all Coalition combat aircraft and cruise missiles. [32]

The ATO provided a very detailed 'shooting-script' for the air campaign - about 600 pages long - and it is difficult to see how the complex operations sustained by the Coalition could have been conducted without the operational control and co-ordination provided by a single ATO.

However, there were difficulties in distributing ATO data throughout the theatre. In particular, the incompatibility of the communications links on-board USN aircraft with the communications equipment of other US services meant that the USN's copy of the ATO had to be hand-delivered to a command ship. USN aircraft "were not easily absorbed into the ATO" as a result of this and other difficulties. [33]

Additionally, disagreements over targeting priorities led to the withdrawal of many United States Marine Corps (USMC) assets from the ATO. [34]

The early French attitudes to the command and control of their Armee de l'air contingent illustrates the potential for serious command problems within the Coalition. Before November 1990, France's Defence Minister insisted that French aircraft would be restricted to operations to protect ground forces. French aircraft were based as far as possible from the major Saudi centre of Dharhnan "to demonstrate their independence from the US". [35] French aircraft were not authorised to strike targets in Iraq until after the war commenced, and the Defence Minister had resigned.

A series of electronic support networks were required to maintain effective command and control of Coalition forces. The Coalition benefited enormously from the long lead-time provided between August 1990 and January 1991 for the installation of these networks. "Six months were needed to set-up and debug" the communications and information systems upon which the integration of Coalition operations depended. [36]

Rochlin and Demchak have concluded that the length of this lead-time, relative to Iraq's actual capabilities, raises disturbing organisational issues associated with the ability of US forces to cope with more demanding opponents than Iraq. [37] Their view is relevant to possible contingencies where a comparable preparation time would not be available.

However, the Coalition had to install its C³I system virtually 'from scratch' and this represented a critical achievement. [38] In addition, the potential difficulties cited by Rochlin and Demchak provide a continuing case for aircraft carriers in more improvised deployments, given that the carriers carry their C³I structure with them. [39]

Intelligence

John Keegan has observed that "commanders must know a great deal before they act and see what they are about to do" - they must have effective intelligence and control. He also notes that "the problem of real-time intelligence probably defies [a perfect] solution [because] those moments..when the flow of information upwards and orders downwards will most nearly match the pace of events - are very, very few". [40]

Keegan's observations are apposite to the Coalition's intelligence operations and their impact on the air campaign. The 5 months between the invasion of Kuwait and the commencement of Operation Desert Storm provided the Coalition forces with the great asset of time to 'know and see' their enemy - including time to update their electronic warfare (EW) systems to KTO conditions with detailed mapping of Iraqi EW and C³ targets, (and to reprogram threat libraries on Airborne Early Warning (AEW) systems). [41]

The Coalition had access to very advanced intelligence collection assets, including up to 7 US reconnaissance satellites and up to 100 reconnaissance aircraft. However, although the US military was "strong on information gathering..it was very weak on intelligence and information assessment". [42]

The Coalition's intelligence difficulties are an issue where independent and official views converge. General Schwarzkopf noted that the need to enhance US battlefield intelligence capabilities was one of the most important lessons of the war. [43] Frank Kendall stated that overall "battlefield surveillance was not commensurate with the capability of our munitions". [44]

Specific shortfalls in Coalition intelligence collection and assessment included, firstly, the under-estimation of the numbers of Iraq's Scud missiles. CENTCOM was embarrassed when its early claims that most Scuds had been destroyed were revealed to be premature by the Iraqi use of mobile launchers. [45] The Coalition subsequently encountered considerable difficulties in locating and destroying these launchers. Secondly, the number of Iraqi nuclear facilities was significantly under-estimated in pre-war intelligence collection. [46]

Thirdly, the use of out-dated information led to a strike on an Iraqi C³ facility in the Baghdad suburb of Amiriyah on February 12/13. 314 Iraqi civilians died in this strike and the adverse international reactions to it were described at the time as potentially "one of the war's turning points". [47]

General Schwarzkopf had set a bench-mark of a 50 per cent reduction in the Iraqi Army's capabilities to be reached before Desert Sword began. The timing of the ground offensive appeared to be one of the Coalition's most critical decisions. [48] If it was launched prematurely, Iraqi resistance might have been higher; if it was launched too late, other factors such as hotter weather, the Muslim festival of Ramadan in March and international sensitivity regarding the prolonged bombing of Iraq could also have created difficulties.

CENTCOM encountered early difficulties in assessing battlefield damage inflicted on the Iraqi Army by air strikes, and its claims were disputed by the more conservative estimates of US intelligence agencies, particularly the Central Intelligence Agency (CIA). [49]

Some of these difficulties were outside CENTCOM's control. Satellite coverage was hindered by cloud cover which persisted over the theatre for 3 weeks of the 6 week war. Of the 7 US military intelligence satellites available, only 1, the Lacrosse radar imaging satellite, could penetrate cloud cover. Moreover, the Lacrosse did not have a wide-area imaging capability and was therefore of limited use in collecting intelligence on the Iraqi Army. [50]

This task was also initially assigned a lower priority than strategic targets in Iraq and Scud missiles. These difficulties resulted in duplication of air strike effort and the failure to locate some targets, such as the main ammunition and supply depot in Kuwait. [51]

CENTCOM's bomb damage assessment had improved by early February, partly because of better intelligence on the results of earlier strikes. [52] Nevertheless, it appears that the timing of the ground offensive was finally determined by a number of factors.

These included what was essentially a best guess of the effectiveness of the air campaign (see p.78); the reasoning that the Coalition could not wait indefinitely for perfect bomb damage intelligence; the desire to avoid another Amiriyah incident, the minimum moonlight prevailing after February 17; and perhaps most convincing of all, the growing numbers of Iraqi troops surrendering to Coalition forces. Freedman and Karsh also note that the CIA's conservative estimates "might have had more influence" if [CIA Director] William Webster had more influence in Bush's 'inner-circle'. [53]

These issues indicate that the Coalition's intelligence operations did not provide a perfect solution to the real-time intelligence problem described by Keegan. However, the

Coalition benefited greatly from the passivity of the Iraqi Army which meant that the pace of events more closely matched the flow of information to CENTCOM. [54]

The ATO was not a perfect solution to real-time targeting. As it was prepared 48 hours in advance of operations it was ill-suited for tasking operations against targets such as the mobile SCUD launchers. However, Saddam's decision to confine most of his front-line forces in static defensive positions greatly assisted the correlation of the Coalition's intelligence flows with its strike operations.

Plans

The use of air power against Iraq featured prominently in United States military planning from the outset of the Gulf Crisis. While there were conflicting views on the capabilities of the Iraqi Army, the United States and its partners were confident of their advantages in air power. General Schwarzkopf focused on the likely vulnerability of the Iraqi Army to air attack in his initial briefing to the National Security Council on August 4 1990. [55] The basic plan for phased offensive air operations against Iraq was developed by the end of August. [56]

There was no argument with the need to suppress Iraq's air defence system as a first priority. However, the subsequent focus of air operations was vigorously disputed between USAF target planners in Washington on the one hand and their Army and Navy counterparts - and indeed to some extent Lieutenant General Horner - on the other. [57]

The concept of the Coalition's four-phased air campaign against Iraq was developed in a Pentagon planning cell known as 'Checkmate', directed by USAF Colonel John Warden. Colonel Warden had published a book in 1989 which reaffirmed

the theory of the decisiveness of strategic air campaigns. He had also developed a targeting hierarchy based on discrete centres of strategic gravity, in which attacks on an opponent's field forces have the least critical value - a priority at odds with Army and Navy views. [58]

Horner opposed Checkmate's emphasis on strategic targets. He considered that it entailed "the Air Force fighting its own war" and thus deviated from a fundamental principle of AirLand Battle. [59] According to Freedman and Karsh "the USAF could not resist the opportunity to demonstrate a decisive [independent] strategic role". [60] (It is therefore ironic that the strategic targets selected by Checkmate were criticised by Dugan for their orthodoxy and, in excluding Saddam, their insufficiency).

By his own account, General Schwarzkopf was initially "leery" of Warden's published views on strategic air power. However, Schwarzkopf endorsed Checkmate's plan in mid-August, principally because Warden's presentation placed as much emphasis on close air support for ground operations as for strategic operations. [61] This also presumably allowed a compromise between different targeting priorities.

Checkmate's outline plan (designated Instant Thunder to deliberately distinguish it from the American Operation Rolling Thunder over North Vietnam in 1965) was passed to Horner's head-quarters in Riyadh for detailed development (see p.59). However, despite Schwarzkopf's endorsement, the dispute over targeting priorities was never resolved "to the point where the ground commanders were entirely happy with the performance of the Air Force". [62]

Pimlott and Badsey assert that "American conservatism in planning and fighting the war is partly explained by anxieties over how well..largely untried technology would

work". They note that, while new weapons technologies have frequently had genuinely revolutionary implications, their initial impact has historically been softened by the conservative influence of prevailing doctrine - as with "submarines or aircraft..before 1914, or tanks before 1939". [63]

This analysis is at odds with the claim that the technological aspects of air power caught up with its prophetic doctrine in the Gulf War. It also raises the question of which institutional view of the conduct of air campaigns was the more conservative in the light of the technology available in 1990: the USAF planners in Washington with their alleged adherence to old ideas of the strategic primacy of air power; or the Army and Navy's devaluation of the alleged potential of modern air power to defeat an opponent in a less sanguinary manner than direct attacks on troops.

Coalition air strength

Estimates of the number of Coalition aircraft vary - Waters calculates that 2,614 aircraft were available at the start of the war; Sibbald gives a lower estimate of 2,430 aircraft as at January 16/17 but notes that this was increased to 2,790 aircraft available by the start of Desert Sword. [64]

Table 1 on the next page details the size of different national contributions to the Coalition's air strength.

Table 1: Coalition aircraft by national source.

| Country | Fighter | Tanker | Airlift | Other |
|----------------|----------------|---------------|----------------|--------------|
| United States | 1323 | 285 | 175 | 207 |
| Saudi Arabia | 276 | 15 | 38 | 10 |
| UK | 57 | 9 | 3 | 4 |
| France | 44 | 3 | 12 | 7 |
| Kuwait | 40 | | 3 | |
| Canada | 26 | | | 2 |
| Bahrain | 24 | | | |
| Qatar | 20 | | | |
| UAE | 20 | | | |
| Italy | 8 | | | |
| New Zealand | | | 3 | |
| Total | 1838 | 312 | 234 | 230 |

Source: Gary Waters, *Gulf Lesson One - The Value of Air Power*, Canberra, 1992, pp. 39-40

Coalition aircraft included 328 air superiority fighters (mainly F-15 C/D Eagles and F-14A Tomcats); 414 multi-role fighters (F-15Es, F-16 C/D Falcons and F/A-18 Hornets); 342 all-weather strike aircraft, including F-111F Pave Tacks and F-117A Nighthawk stealth fighter-bombers; up to 80 USAF B-52G heavy bombers; 415 Close Air Support/Battlefield Air Interdiction (CAS/BAI) aircraft, including 168 USAF A-10 Thunderbolts; 95 Electronic Warfare/Suppression of Enemy Air Defence (SEAD) aircraft; and 119 reconnaissance and AEW aircraft. [65]

The latter group included 8 USAF and 5 RSAF Airborne Warning And Control Systems (AWACS) aircraft, 2 prototype USAF E-8A Joint Surveillance Target Attack Radar Systems (J-STARS) aircraft, and two Airborne Command and Control Center (ABCCC) EC-130 aircraft. These 3 aircraft types "were critical to the direction and co-ordination of air operations". [66]

The AWACS aircraft have two primary functions: to detect and control interceptions on hostile aircraft and to prevent fratricide of friendly aircraft. The first task proved less demanding than expected because the Iraqi Air Force made only limited attempts to engage Coalition forces.

However, these capabilities were notably demonstrated when, probably in deference to Coalition solidarity, an AWACS aircraft cleared friendly aircraft away from two Iraqi Mirages and directed a Saudi pilot to their interception. [67] (This was the only air-to-air engagement of the war where Iraqi aircraft were not destroyed by US aircraft).

The AWACS were highly effective in preventing fratricide incidents; it is remarkable that these were entirely avoided throughout the 43 day conflict, in which the Coalition launched an average of 2,500 sorties per day.

The J-STARS aircraft are designed to provide long-range surveillance of enemy ground targets and movements. The two used in the Gulf War were rushed from development programs and deployed 5 days before the war. They provided particularly valuable intelligence on mobile targets such as Scud launchers and Iraqi Army formations. The real-time targeting capability provided by J-STARS aircraft provided a remedy to the relative inflexibility of the ATO, especially in the 'Scud hunt'. [68]

The ABCCC aircraft provided air battle co-ordination and the direction of aircraft against specific targets. The operations of all three aircraft types were co-ordinated through an air-to-air and air-to-ground communications system called the Joint Tactical Information Distribution System (JTIDS). [69]

The US Army deployed 185 AH-64 Apache attack helicopters and a number of other helicopter types. Apaches conducted the first air strike of the war and featured prominently in ground-attack missions during Operation Desert Sword.

US command authorities were confident that the United States and its partners could achieve an early air superiority against Iraq, despite their pre-war predictions of high US attrition rates. [70]

While the Iraqi Air Force's (IAF) campaign against Iranian cities and other strategic targets during the Iran-Iraq war contributed substantially to Iran's defeat, most assessments concurred that the Coalition air forces held clear qualitative advantages over the IAF, including the much greater depth of their operational experience and training. [71]

Given that CENTCOM planned an air campaign conducted with maximum and constant impact, an important indicator of these qualitative advantages is mission capability rates. The USAF achieved rates greater than 85 per cent for most of its combat/strike aircraft. This represented an average increase of 7.1 per cent over peacetime mission capabilities - a marked contrast to the IAF's maintenance difficulties described below. [72]

The Coalition's air campaign involved much longer sortie durations than in peacetime norms. The average duration of

an F-117A sortie, for instance, was 5.4 hours compared with a peacetime average of 1.6 hours. [73] (The F-117As high sortie durations also reflected the basing of these very valuable aircraft in the south-west corner of Saudi Arabia at a maximum distance from any Iraqi threat). The large distances between Coalition air bases and Iraqi targets, coupled with the need to sustain high sortie rates, made the role of Air-to-Air Refuelling Tankers particularly critical. The high sortie durations of Coalition aircraft also increased their maintenance requirements.

The Coalition's qualitative advantages in air power were amplified by the very rapid deployment of United States' and other Coalition aircraft to the Middle East. The Coalition achieved a quantitative superiority in combat aircraft against Iraq in just over 4 weeks after the invasion of Kuwait - and, as noted, had doubled this strength again by January 1991. [74]

Iraqi Forces

Critical details of Saddam Hussein's strategy against the Coalition remain obscure and attempts to reconstruct them remain dependent on 'best-guesses'. It seems improbable that he expected Iraq to defeat the Coalition - Saddam was reluctant to risk his air force in ventures larger than 'penny-pocket' operations, and he did not commit the Republican Guard, Iraq's elite force, to forward positions because "he dare not risk its loss". [75] (Indeed, the survival of the Republican Guard enabled Saddam in turn to survive the civil unrest which followed the war).

It has been suggested that Saddam's decision to halt his forces at the Saudi border forfeited the strategic surprise he achieved in the invasion of Kuwait and that this, combined with his failure to disrupt the Coalition build-up

in Saudi Arabia, effectively determined the outcome of the Gulf War. It has also, however, been pointed out that this halt reflected the strain the invasion imposed on Iraqi logistical capabilities - as the withdrawal of some Iraqi units from Kuwait shortly after the invasion indicated. [76]

The clearest element of Saddam's strategy was his attempt to destabilise the Coalition by provoking an Israeli intervention. By basing his military options on an intensive defence against both air and ground attacks, Saddam may have also sought to raise the cost of a Coalition victory to the point where it enabled him to emerge as a political victor from the war. At a best result, this might have permitted Saddam to retain some of his gains in Kuwait. [77]

Iraq's Integrated Air Defence System (IADS) was based on the Soviet model of centralised control over both the IAF and ground-based air defences. The IAF's very limited impact on the air war confirmed pre-war assessments that it was "the most obvious weakness in the Iraqi military structure". [78] Nevertheless, the IAF, like the Iraqi Army, was characterised as much by the unevenness of its capabilities as by more general deficiencies.

The IAF "had the numbers" - between 500 and 800 aircraft - to seriously disrupt initial Coalition attacks, particularly if the IADS network functioned as intended and effectively co-ordinated ground and air defences. [79] However, the IAF suffered from serious training and maintenance deficiencies and aircraft of uneven quality. [80]

The IAF possessed between 320 and 370 interceptors, including over 50 MiG-29 Fulcrum fighters. While a very capable aircraft, the MiG-29 is difficult to maintain, and its effectiveness was substantially degraded by the

withdrawal of Soviet technical support. [81] The IAF's interceptor force was supplemented by 328 Mirage F.1 dual-role fighters with an Exocet anti-ship missile capability. The F.1 had accounted for the majority of Iraqi air-to-air kills in the Iran-Iraq War and its pilots included the small number trusted to receive foreign training. [82] Iraq possessed about 24 Su-24 Fencer bombers which represented its only modern strategic-strike aircraft.

The IAF's maintenance deficiencies were indicated in an estimate that approximately 175 Iraqi aircraft were unserviceable in January 1991. [83] The IAF's capabilities were compromised by the withdrawal of the technical support services provided by France and the Soviet Union, and their release of technical data on Iraqi equipment to the United States. [84]

The poor training of many Iraqi pilots was an even more critical deficiency. This is illustrated by an incident on January 17 1991, reconstructed by Sibbald, when an Iraqi MiG-29 pilot shot down his wingman before colliding with the debris and being destroyed himself.

"Apparently unaccustomed to the sophisticated air-to-air radar of the MiG, the Iraqi pilot had simply taped the radar button down so that it locked on to the first target it acquired...being of a nervous disposition, the pilot also kept his firing button permanently depressed..". [85] (As both planes were destroyed it is not clear how Sibbald reconstructed this event).

The IAF flew around 200 sorties per day immediately before the war - less than a quarter of its potential. This probably reflected the impact of the UN's economic sanctions; it meant that Iraqi pilots were poorly trained for such tasks as air-to-air refuelling and night-flying.

The IAF lacked an effective Identification Friend or Foe (IFF) signalling system, as also suggested by the fratricide incident on January 17. [86]

USAF personnel described Iraq's ground-based air defence network as the most concentrated system of its kind outside of the Soviet Union. [87] Major elements of this network included approximately 70 area-defence surface-to-air missile (SAM) batteries under IAF control, and up to 140 point-defence SAM batteries under Iraqi Army control - in total approximately 7,000 individual SAMs. The Iraqi Army also deployed approximately 4,000 anti-aircraft artillery (AAA) guns which covered major Iraqi cities and other strategic centres. [88]

Iraq's airspace was divided into four regional defensive zones, each controlled by a major C³ centre which identified and assigned targets to air and ground assets. [89] The IADS network was supported by approximately 100 surveillance/acquisition and early warning radars with hardened C³ facilities. [90] The network incorporated a redundancy of communications and other system elements to provide 'graceful degradation' under attack. [91]

The Iraqi Army operated a separate air defence system in the KTO which included numerous man-portable SA-7 and SA-14 missile systems. These constituted a threat throughout the war to Coalition aircraft conducting low-altitude ground-attack missions.

Overall, Iraq's IADS constituted a major national investment with some 'state of the art' elements. Its major weakness, shared with the Iraqi Army, was a dependency on centralised control. The concentration of C³ functions in a relatively small number of central nodes made the entire network vulnerable to strikes with precision weapons. This physical

destruction may have been less debilitating had operational authority been decentralised. [92]

However, Saddam's insistence on centralised command meant that commanders at all levels "were unable to take decisions or initiate actions". [93] This contributed to "the paralysis of Iraq's armed forces" in the Gulf War, which was compounded by Saddam's mis-reading of the implications of the Iran-Iraq War. [94] The IAF's attacks on Iranian cities and other strategic targets in 1988 had reinforced the impact of the Iraqi Army's offensives; Saddam's decision to adopt a defensive strategy in 1991 ignored both these lessons.

Iraq deployed between 350,000 and, by the Pentagon's initial estimate, 545,000 troops in the KTO. The Pentagon's estimate was later generally considered to be too high. Tamayo and Woodward calculated that 350,000 Iraqi troops were deployed in the KTO on January 17, but that Iraqi strength had fallen to as low as 200,000 men by the start of the ground war - largely through desertions. [95]

The Pentagon estimate was based on the 43 Iraqi divisions in the KTO (out of a total of 60 army divisions) identified in satellite imagery. However, prisoner-of-war interrogations later indicated that many units were well below strength, and that desertions exceeded the Pentagon estimate of 150,000 troops. [96]

The Pentagon estimated that Iraq deployed 4,280 tanks, 2,750 other armoured fighting vehicles, and 3,100 artillery pieces in the KTO. These figures were also subsequently disputed, although one analyst estimated that the Iraqi Army deployed greater quantities of heavy weapons in the KTO than officially estimated. [97] 7 of the 8 Republican Guard divisions were deployed to the northern sector of the KTO as

a mobile theatre reserve, or for recall if an internal threat emerged. [98]

Assessments of the Iraqi Army's capabilities differed markedly before the Gulf War. Some maintained that the Iraqi Army's offensives against Iran were usually successful only in conjunction with (frequently unreliable) chemical weapons attacks. However, others considered the Iraqi Army to be a highly capable force which could prove difficult to overcome. Antal's analysis written in early 1991, and a subsequent Pentagon assessment, noted the Iraqi Army's evolution into a force capable of conducting deep, combined-arms offensives against Iran. [99]

This success makes Saddam's defensive strategy more surprising, particularly when the substantial Iraqi desertions early in the Iran-Iraq War, after Saddam had "voluntarily surrendered the initiative to Iran" demonstrated the consequences of passivity. [100]

Saddam's defensive strategy is explicable in the light of the Iraqi logistical difficulties, and his perception that the United States could not sustain heavy casualties, already cited. It was nevertheless flawed, although a more mobile strategy would have required a level of support from the IAF which was unlikely to be present.

The Iraqi Army had constructed a layered defensive system (the 'Saddam line') across Kuwait's southern border. These defences increased the potential cost of an early Coalition ground offensive, especially one based on a frontal assault. However, the Saddam line terminated a short distance west of the Kuwaiti-Saudi border and was therefore vulnerable to an outflanking manoeuvre.

Although this option was discussed in the Western media before the war, there is no evidence that Iraqi commanders seriously considered it. They apparently considered Iraq's interior to be unsuitable for heavy armour - as initially did some Coalition commanders. [101]

The US Army XVIII Airborne Corps and VII Corps were repositioned during the air campaign to their start lines for the out-flanking manoeuvre. Their respective movements involved distances of 800 km and 400km. [102] That they could accomplish this without Iraqi detection indicates the early general collapse of Iraqi intelligence collection capabilities. [103] This collapse throws into relief the otherwise limited benefits Iraq derived from continuing access to US weather satellite data through the war. The predictions of cloud cover derived from this data enabled Scud launches to be scheduled accordingly. [104]

Neither the Iraqi Army's logistical nor its command problems were resolved by Saddam's defensive strategy (see pp.74-75). Its potential effectiveness was also degraded by his under-estimation of the capability of the Coalition's PGMs to severely attrit his army. [105] Despite its difficulties in assessing bomb damage, the Coalition destroyed Iraq's ability to challenge its ground offensive, "where Saddam had once assumed his forces could be employed to their greatest advantage", by prolonging the air campaign. [106]

NOTES

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[9] Freedman & Karsh, op cit, p.435.

[10] L. Aspin, The Aspin Papers: Sanctions, Diplomacy, and War in the Persian Gulf, CSIS, Significant Issues Series, Vol. XIII, No.2, 1991, p.53,.

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[13] Pimlott & Badsey, op cit, pp.54-55.

[14] Woodward, op cit, p.334.

[15] Waters, op cit, p.35.

[16] Freedman & Karsh, op cit, p.341.

[17] Ibid, p.331.

[18] Ibid, p.367.

[19] Waters, op cit, p.131

[20] Freedman & Karsh, op cit, p.287..

[21] Ibid, p.285.

[22] Ibid, p.318.

[23] Pimlott & Badsey, op cit, p.66.

[24] Ibid.

[25] Woodward, op cit, pp.267-268.

[26] F. Toase, in Pimlott & Badsey, op cit, p.148.

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[30] Ibid, pp.5-6.

[31] Ibid, p.6

[32] Ibid, p.11

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[39] W. Crowe (with D. Chanoff), The Line of Fire, New York, 1993, p.326.

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[45] Freedman & Karsh, op cit, p.307.

[46] Ibid, p.321.

[47] AWST, New York, 18/2/91, p.7.

[48] Freedman & Karsh, op cit, p.366.

[49] Ibid, p.369.

[50] Ibid, p.368.

[51] Ibid, p.368.

[52] Ibid, p.370

[53] Ibid, pp.370-371.

[54] Gregory, op cit, p.11.

[55] Woodward, op cit, p.251.

[56] Freedman & Karsh, op cit, p.316.

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[60] Freedman & Karsh, op cit, p.437.

[61] H.N. Schwarzkopf, op cit, p.318.

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[63] Pimlott & Badsey, op cit, p.271.

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[101] S. McKnight, in Pimlott & Badsey, op cit, p.184.

[102] F. Toase, Ibid, p.152.

[103] Ibid, p.156.

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CHAPTER 3 - AIR OPERATIONS

The air campaign sought to gain air supremacy, disrupt Iraqi command and control, destroy a range of Iraqi strategic-economic targets including its nuclear, biological and chemical (NBC) warfare capabilities in Phase 1; suppress enemy air defences in the KTO in Phase 2; and interdict C³ links between Iraqi command authorities and their forces in the field, and 'shape the battlefield' with direct attacks on these forces in Phase 3. [1]

These phases were scheduled to continue for 30 days. While both naval and ground operations, including the use of Special Forces teams operating inside Iraq and Kuwait, were incorporated in Desert Storm, air operations were predominant.

These operations would be immediately followed by Phase 4 - Desert Sword - involving a ground offensive supported by air and naval operations against the Iraqi Army "to exploit the shock effect" of the air campaign. [2]

The plan for Desert Sword was based on a deep out-flanking manoeuvre west of the junction of the Iraqi-Kuwaiti-Saudi borders which, coupled with more direct approaches into Kuwait, aimed to trap Iraqi forces in a double-envelopment. These thrusts were to be supported by feints, such as rehearsals for an amphibious assault that never came and electronic deceptions, designed to fix Iraqi attention on the eastern flank of the KTO. [3]

The number of aircraft available enabled CENTCOM to commence parallel strikes on the full range of Iraqi target sets from the outset. The originally discrete operational phases were thus merged - in particular, the IAF's general inactivity

meant that Phase 2 was largely subsumed into Phase 1. However, CENTCOM's targeting emphasis changed as the war progressed and air operations therefore retained some resemblance to the original phases. [4]

The air campaign extended for 8 days longer than its scheduled 30 days. This partly reflected the difficulties the Coalition encountered in operations against some targets, such as mobile Scud launchers and Iraqi airfields. In addition unusually poor weather resulted in the cancellation of 40 per cent of strike sorties in the first 10 days of the war. [5]

Notwithstanding the critical importance of the air campaign in defeating Iraq, there are good grounds for concluding that Coalition leaders recognised that it had reached a point of diminishing returns, in both military and political terms, by mid-February.

Phase 1 - The attainment of air supremacy and attacks on Iraqi strategic targets.

The main objectives of Phase 1 were scheduled to be completed within 7 days, although attacks on strategic targets continued throughout the war. 12 sets of Iraqi strategic targets were identified by CENTCOM target planners, as detailed in Table 2 on the next page.

Table 2: Iraqi strategic targets

| TARGET | NUMBER | SORTIES |
|----------------------------|------------|---------------|
| Electric power | 28 | 215 |
| Naval | 20 | 247 |
| National Command Authority | 26 | 429 |
| Air Defence | 29 | 436 |
| Oil | 28 | 518 |
| C ³ | 170 | 601 |
| Transportation | 54 | 712 |
| NBC | 31 | 902 |
| Military support | 96 | 2,756 |
| Scuds* ¹ | 30 | 2,767 |
| Airfields | 66 | 3,047 |
| Republican Guard | 145 | 5,646 |
| TOTAL | 723 | 18,276 |

¹* The number of Scud targets appears to refer to the number of fixed launch sites identified before January 17; most Coalition sorties were against mobile launchers.

Source: Freedman and Karsh, *The Gulf Conflict 1990-91*, p.330, from various sources including CENTCOM, Greenpeace.

The integration of Iraq's civil and military sectors down to the level of individual facilities meant that strikes on many targets, such as the Amiriyah C³ facility, ran the risk of causing civilian casualties, despite the care taken to minimise them. [6]

The political repercussions of civilian casualties were self-evident to the Coalition. However, despite the intensity of the air campaign, the number of civilian casualties directly attributable to it was limited. An official Iraqi estimate calculated that 2,278 civilians were killed and 5,965 wounded in the war - totals that were greatly exceeded in the civil unrest which followed it. [7]

However, the immediate effects of the war and its aftermath were amplified by another consequence of the air campaign. As discussed in Chapter 1, the strategic relevance of attacks on Iraqi electrical power facilities has been questioned. While a relatively small number of strikes, 215, were launched against electrical power targets, these were the most severely damaged Iraqi target set in the war. [8]

The destruction of the Iraqi electrical power system contributed to the collapse of Iraqi command and control. In addition, many facilities were disabled by thousands of carbon-fiber wire reels dispensed by TLAMS. These reels short-circuited power plant transmission grids. These facilities were claimed to be "soon back in action, thus softening the impact of the war on civilians". [9]

However, the US Defence Department later acknowledged that "some target sets, such as electrical power production were more heavily damaged than originally planned". [10] The difficulty of repairing this system has since impacted severely on Iraqi public health. In October 1991 a Harvard University team found that the death-rate among Iraqi infants had increased four-fold since the war. [11]

Initial attacks and the attainment of air supremacy

The extent to which the Coalition had been able to compile detailed intelligence on Iraq's strategic structure is demonstrated by the variety of targets attacked in the first 24 hours of the war and thereafter. Notwithstanding this, shortfalls in intelligence on particular target sets later emerged, as noted in Chapter 2.

While only 45 strategic targets were selected in Baghdad, these included centres with a particularly high value to Iraqi command and control. CENTCOM's plans were modified following General Dugan's remarks that "the cutting edge" of the air campaign "would be in downtown Baghdad".

Anticipating that Baghdad's defences would be strengthened, CENTCOM restricted operations against targets in it to F-117As and cruise missiles. [12]

Expectations that the Coalition would commence operations 'sooner rather than later' could have compromised strategic surprise and increased losses. However, the Coalition achieved strategic surprise through a complex sequence of aerial feints coupled with a co-ordinated and massive application of main aerial force.

CENTCOM set 3 am on January 17 as H-Hour. The main-force Coalition attacks were preceded shortly before H-Hour by Apache helicopter strikes mounted by the US Army's 101st Airborne Division. These strikes destroyed Iraqi air defence early-warning radar sites in south-west Iraq with laser-designated Hellfire missiles. This enabled EW aircraft to enter a 'radar-black' corridor into Iraq. [13]

Large formations of Coalition aircraft flew to and away from the Iraqi border on several occasions between November 1990 and January 1991. This manoeuvre was repeated on the night

of January 16/17; when most of their accompanying formation turned back, the F-117As, supported by stand-off jamming aircraft, flew on to Baghdad undetected. [14]

The F-117As struck C³ targets in Baghdad, including the IAF's headquarters and Iraq's main telecommunications facility, at H-Hour, almost simultaneously with TLAMs. Elsewhere, other F-117As struck air defence facilities in southern Iraq, F-15Es struck SCUD missile launch sites in western Iraq and RAF Tornado GR.1s struck Iraqi airfields in low-altitude raids. [15]

The F-117As struck 31 per cent of all Iraqi targets selected in the ATO for the first 24 hours of the war, a figure rising to 40 per cent by its end. By then the 48 F-117s in the theatre had flown 1,271 "of the most dangerous attack missions in Desert Storm" for no loss. [16] All F-117 strikes were conducted with PGMs. This aircraft's high success rates against difficult targets, and the fact that none were lost, have been cited as proof of the maturation and strategic importance of stealth technology.

However, according to some critics, the initial support provided to F-117 missions by EW aircraft puts a different slant on the F-117's alleged 'invisibility' to Iraqi radar. [17] The F-117s may also have been accompanied by the highly classified TR-3A Black Manta delta-wing stealth reconnaissance aircraft. The Black Mantas are designed to collect and transmit near real-time digital photo data for immediate tactical applications. [18] The possible use of these aircraft underlines the strategic importance assigned to F-117A strikes.

The USN fired a total of 291 TLAMs at strategic targets in the war, 264 of which delivered conventional high explosives and 27 which delivered sub-munitions - including the carbon-

fibers used to disable power stations. [19] As with other operations, uncertainty about the effectiveness of these weapons led to multiple strikes on the one target early in the war, although CENTCOM's confidence in its weapons subsequently increased. [20]

35 AGM 86C ALCMs were launched from 7 B-52s against electric power facilities and C³ targets on January 17 in "the longest conventional air strike mission in history" - the B-52s sortied from Barksdale Air Force Base, Louisiana, about 18 hours before H-Hour. [21] This operation was the only use of ALCMs in the war.

EF-111A Ravens, EA-6B Intruders and EC-130 Compass Call aircraft supported the early strikes with electronic jamming of Iraqi radars. As both the EF-111A's jamming equipment and much of Iraq's air-defence equipment dated from the 1970s, this fortuitous matching enabled the EF-111As to penetrate Iraq's electronic defences particularly effectively. [22]

The three most significant individual Coalition actions in its effort to attain air supremacy were an F-117A attack on the IAF's headquarters; SEAD attacks on the Iraqi air defence radar network; and the offensive counter-air effort against Iraqi airfields and hardened aircraft shelters (HAS).

As noted in Chapter 2, many analysts have emphasised the IAF's poor level of training. However, Coalition action may have exacerbated the impact of this factor. A prime reason for the IAF's passivity may have been the loss of many of its better foreign-trained aircrew in the F-117 strike on its Baghdad headquarters on January 17. [23] If so, the presence of these pilots in Baghdad rather than with their aircraft is surprising.

Although it was hardened, this building was above ground. Its relative exposure compared to other key Iraqi targets - Saddam's personal headquarters and the Republican Guard's command facilities were located below ground - may have illustrated the deep distrust Saddam held towards his armed forces. (There were three attempts at a military coup against Saddam between 1988 and 1991). [24]

It appears clear that Saddam enforced a system of centralised command and control primarily to ensure his political survival, and only secondarily for its military benefits. According to McKnight, "the air force was particularly feared by Saddam" because of its "well-known potential to decapitate a regime" - the IAF's headquarters was not only vulnerable to Coalition aircraft, it was also vulnerable to the Republican Guard. [25]

SEAD attacks began 20 minutes after H-Hour and continued for the first 3 days of the war. USN aircraft supported these attacks with a major deception operation. They released 137 ADM-141 Tactical Air Launched Decoys (TALDs) which mimicked the radar signatures of attacking aircraft. These decoys, together with the TLAM attacks and airborne jamming, lured the Iraqis into activating or increasing the power levels of their radars. [26] In essence, the Iraqi air defence radars were manoeuvred towards an electronic feint and were thus exposed to the main blow.

Iraqi attempts to intercept the TALDs with SAMs and fighter aircraft revealed the positions of Iraqi surveillance/acquisition and SAM guidance radars to the SEAD force. These aircraft - USAF F4-G Wild Weasels, USN F/A-18s and EA-6B Intruders - fired approximately 1,000 High Speed Anti-Radiation Missiles (HARMs) at Iraqi radar sites. [27] These attacks were very successful: 100 Iraqi air defence radar transmissions were logged in the first 4 hours of the

war. Thereafter, only 15 transmissions were logged up to January 28. [28] Ironically, the USAF had opposed the TALD program on the grounds that stealth aircraft would make it redundant. [29]

Most SAMs used after these attacks were launched in a largely ineffective unguided ballistic mode. This enabled most Coalition strike aircraft to bomb at altitudes above 10,000' - out of range of most surviving Iraqi ground defences. [30] However, low-altitude RAF Tornado strikes against Iraqi airfields early in the war, and ground-attack missions throughout it, were at greater risk to Iraqi ground-fire. [31]

By early February centralised Iraqi air defence control had been abandoned. [32] Many analysts have claimed that the rigidity inherent in the centralised control structure of Iraq's IADS made the 'graceful degradation' for which it was designed virtually impossible. [33] To some extent their conclusions are valid.

The dependence of the IADS on just 29 focal strategic nodes made it potentially vulnerable to a limited number of successful strikes, although the number of sorties actually mounted against them, 436, was sizeable - which perhaps reflected initial uncertainties about the effectiveness of Coalition strikes. However, an effective defence against an air campaign of the scale mounted by the Coalition would have required a well-coordinated and responsive defensive system; it is difficult to see how this could have been achieved without centralised direction.

It may be salutary to consider that the Coalition air campaign would have been severely disrupted had a vigorous effort been successful against its limited number of assets - the 13 AWACS, 2 J-STARS and 3 ABCCC aircraft - which

provided the electronic basis for effective aerial command and control. [34] The quick collapse of the Iraqi IADS shows that the vulnerability of complex strategic infrastructure to modern weapons provides an advantage to a side which strikes a successful surprise blow.

On January 24 General Powell announced that the Coalition "had achieved air superiority throughout the entire theatre". This followed a decline in Iraqi sorties from 120 on January 17 to 40 by January 24. [35] However, Powell's accompanying statement that there was "no point in wasting further effort now on destroying Iraqi aircraft" was premature. The effort to destroy Iraqi aircraft continued after January 24, but with a change in emphasis in the Coalition's airfield-denial tactics from attacks on Iraqi airfield runways to attacks on Iraqi HAS.

While the collapse of centralised control probably eliminated the IAF's ability to seriously contest Coalition attacks, "it took a while" before the Coalition was confident of this. [36] Attacks on airfields were therefore continued to ensure the IAF's capacity was not revived. 66 airfields were finally targeted by the Coalition; 1,300 sorties were launched against these by January 31.

However, only 9 airfields were confirmed as destroyed - 8 of them by RAF Tornado aircraft, armed with the JP-233 airfield denial munition, in dangerous very low-altitude missions. Each JP-233 dispensed 30 cratering bomblets and 215 delayed action mines to destroy airfield runways. [37] The Tornados sustained disproportionately high losses - 6 were lost before their runway strikes were suspended on January 25 - although only 1 Tornado was claimed over an airfield. [38]

The difficulty of the runway attacks was exacerbated by Iraqi deceptions including the painting of fake bomb damage

on undamaged air fields to confuse strike aircraft. The Tornado losses, although statistically small, encouraged the shift to HAS attacks, using stand-off PGMs, after January 24.

Iraq's reaction to the HAS attacks demonstrated that it had ceded air supremacy to the Coalition. The exit of Iraqi aircraft for Iran accelerated after the HAS attacks commenced. Between 7 to 24 Iraqi aircraft flew to Iran between January 20 and January 26 - increasing to 80 aircraft by January 28 and finally to 122 aircraft.

68 Coalition (including 56 US) aircraft were lost in combat in the war. A further 22 aircraft were lost in accidents. However, none were destroyed by Iraqi aircraft. 42 Iraqi aircraft were destroyed in air-to-air combat - all but two by US aircraft. In addition, between 68 and 141 Iraqi aircraft were destroyed in ground-attack missions - this range reflects variations in the estimates of the number of aircraft destroyed in HAS attacks. [39] Such one-sided exchange ratios have only been previously achieved by the Israeli Air Force for much briefer periods.

Command and Control targets

The increasing accuracy of nuclear weapons led in the 1980s to the emergence of ideas that an opponent's ability to maintain military command and control could be 'decapitated' by a limited number of strikes on primary command centres. [40] These ideas were extended into conventional warfare.

Air strikes on the Iraqi C³I structure were intended to "sever the connections between the Iraqi high command..and the Iraqi forces, and to curtail the flow of intelligence" to command authorities. [41] The Pentagon later stated that "if rendered unable to command and control their military

forces..they might be compelled to comply with Coalition demands". [42]

Secretary Cheney stated on January 27 that "We clearly are interested in destroying" [the Iraqi] national command authority". While Cheney distinguished between attacks on Saddam as a "specific individual" and attacks on the national command authority as a collective entity, it is clear that a major effort was mounted to eliminate Saddam. [43]

2 USAF F-111Fs used the new 4,700-lb GBU-28 ground penetration bomb on the last night of the war against a bunker where Saddam was believed to be located. [44] However, Saddam was not in this complex and was more fortunate than many of his subordinates; the Pentagon estimated that only a third of senior Iraqi commanders survived Coalition air attacks and Saddam's purges of 'incompetent' commanders. [45]

CENTCOM estimated that at the end of January 75 per cent of Iraq's C³ facilities had been struck, with one third rendered irreparable. This forced the Iraqis to use more vulnerable and less effective back-up systems - by mid-February, it took 24 hours for a message from Baghdad to reach the front. [46] The destruction of Iraqi command and control may have even been too effective. Heikal claims that Baghdad ordered a withdrawal from Kuwait at the start of Desert Sword, but communications difficulties prevented this message from being received by some units until they were already engaged. [47]

While many Iraqi communications links survived, Iraqi communications activity was clearly reduced - largely because field commanders were apprehensive their communications would be tracked by Coalition signals

intelligence and their units would be bombed. [48] Arkin's point that many Coalition strikes against C² facilities were directed against denuded facilities may be valid; however, by forcing the removal of electronic equipment for the duration, the threat of these strikes achieved an important coercive strategic purpose.

Scuds

Iraqi Scud attacks commenced on January 18, when 8 missiles landed on Israeli cities. In all 40 missiles were launched against Israel and 46 against Saudi Arabia during the war. The limited effectiveness of these strikes is shown by the low casualties resulting from them. 4 persons were killed and 185 injured in Israel; 31 persons were killed and about 400 injured in Saudi Arabia, including 28 US personnel killed in a strike on Dharhran on February 25. 37 Scuds were successfully intercepted by US Army Patriot point defence missiles. [49]

Despite their limited effectiveness, the Scuds provoked a disproportionate response. They posed a particularly difficult dilemma for Israel, whose strategic policy for over 4 decades has been based on retaliation. However, in this crisis an Israeli retaliation could benefit Saddam - he sought to "trigger a response, not to avoid one". [50] At an Israeli Cabinet meeting called to discuss the first strikes, the Israeli Chief of Staff advised that "an Israeli response would cause severe damage to the international coalition", a view accepted by the Cabinet. [51]

However, after 3 Scuds struck Tel Aviv on January 20, Israeli aircraft were scrambled both as a precaution against a follow-on Iraqi air attack and "to save time" if ordered to retaliate. [52] This attack was only averted after Secretary Cheney was contacted by the Israeli government.

Cheney undertook to supply the Israelis with real-time data on Scud launches and to dispatch Patriot batteries, with their US crews, to Israel.

The Israelis had initially requested the release of IFF codes and the opening of an air corridor for four hours to Israeli aircraft. Cheney refused these requests. His refusal demonstrated that the mechanics of modern military command and control have wider political implications beyond control of the battlefield. However, a contingency plan had been drawn up, should the Israelis have proceeded with a retaliatory strike, for a corridor to be cleared of Coalition aircraft. [53]

The 'Scud-hunt' involved a very intensive effort from Coalition aircraft which peaked at 150-200 sorties per day and reached 2,493 sorties in total. These strikes did not eliminate Scud launches but they significantly reduced them from an average of 5 per day up to January 27 to an average of 1 per day thereafter. [54] The mobile Scud launchers proved difficult targets. Their missiles were mainly fired at night and could be prepared and launched within an hour, although such rushed launches further reduced their limited accuracy. As in other aspects of the war, the Iraqis also proved adept in the use of decoys to confuse attacking aircraft.

The Coalition used a combination of standing combat air patrols (mainly F-15s) over the main Scud launch areas, and attacks by A-10s on the access roads to these areas, to suppress Scud launches. [55] These operations benefited from J-STARS and satellite data, although these assets could not easily distinguish between real and decoy launchers. The Coalition also relied heavily on Special Forces ground teams to locate and laser-designate Scud launchers for attacking aircraft.

The relative difficulty of the Scud hunt indicates the value of small, mobile units that are able to take advantage of surprise and night conditions even when faced with an opponent as militarily resource-rich as the Coalition. However, such tactical advantages were offset by the reduction in accuracy caused by the threat of air attacks. The fall in Scud launch rates shows that the missiles would have posed a greater threat without the suppressive air strikes.

The Scud-hunt was an important strategic success, most critically in helping quell Israeli anxieties. Without the fall in launch rates the air attacks produced the political pressure for an earlier and possibly more costly start to the ground-offensive may have been irresistible. As it was, the persistence of the Scud strikes provides a strong argument against the proposition that air power alone could have won the Gulf War.

The Scud attacks "gave Saddam the right to claim that Iraq was taking the fight to the enemy, and attacking the hated Zionists on behalf of all Arabs". Without a ground campaign, Saddam could have withdrawn his army from Kuwait, however battered it was, undefeated, and "the Scud campaign would have helped to create a myth of Iraqi victory". [56]

NBC

The Scud strikes, and other Iraqi operations, would have been more dangerous had they been combined with Iraqi chemical warfare capabilities. The use of chemical weapons against the Coalition now appears to have been precluded by Secretary Baker's warning on 9 January that the United States would hold the Iraqi leadership directly accountable for their use, although these weapons weighed in CENTCOM's

calculations of potential threats until the end of the war.
[57]

The Coalition found no evidence that chemical weapons were issued to Iraqi field commanders. [58] However, the USAF has claimed that an F-117A strike in late January destroyed Iraqi bombers that were preparing for a chemical weapons attack. [59]

While the destruction of Iraqi NBC capabilities was not specifically authorised by the UN, "they were seen as the basis for Saddam's ability to intimidate the region in the future, so their elimination was a war aim in itself". [60] Iraqi nuclear capabilities were considered the most important unconventional weapons target; the air attacks on them may indicate an increasingly blurred demarcation between conventional and non-conventional warfare. [61] Significantly, the last F-117A strike in the war was against an Iraqi nuclear facility soon after its late detection. [62]

General Schwarzkopf claimed at the end of January that all known Iraqi nuclear facilities were destroyed. However, the defected Iraqi scientists claimed that the Coalition had only targeted 3 of Iraq's 7 nuclear weapons development sites, and that significant assets survived even at these. [63] As noted, this, and the revelation that Iraq's nuclear weapons program was far more advanced than first considered, illustrates one of the Coalition's critical intelligence difficulties.

Phases 3 and 4 - Battlefield Preparation & Desert Sword

The air attacks on the Iraqi Army in the KTO before the start of Desert Sword were designed to "isolate ground forces from resupply and reinforcements..to compel these forces to consume supplies, and finally to apply pressure in such a way as to sap their morale" - or, as Powell put it, to cut the Iraqi Army off, "then kill it". [64]

Mason has described the KTO as a salient where Iraqi defensive advantages could be overcome by aerial encirclement. [65] The Iraqi Army was dependent on extended lines of communication (LOCs), which were vulnerable to aerial interdiction, particularly if key choke-points - the bridges over the Tigris and Euphrates rivers in the Basra region, the neck of the KTO salient - were destroyed. [66]

Under Coalition air attack, its strategic over-extension terminally strained both the Iraqi Army's C³ and logistics systems. McKinley wrote that its logistical vulnerability became the Iraqi Army's "death sentence". [67]

Communications delays forced Saddam to move near the front to take personal charge of the Khafji attack in late January - an illustration of how Coalition air attacks exploited the rigidity of the Iraqi command structure. [68]

By the end of the war, over 35,000 sorties had been flown against the Iraqi Army, including 5,600 sorties against the Republican Guard. [69] This represented about 70 per cent of all the Coalition's combat/strike operations. While a 50 per cent reduction in the combat capabilities of front-line forces was claimed by CENTCOM by the start of Desert Sword, the Republican Guard was less damaged. [70]

As noted earlier, other demands substantially reduced the aircraft initially available for these attacks. Strikes

against the Republican Guard, for instance, only became fully effective as late as February 15, when F-16s became available - the A-10s previously used were more vulnerable to ground fire. [71]

By January 30, General Schwarzkopf claimed that supplies to Iraqi troops had already been cut by 50 per cent, although this was disputed by others. [72] Schwarzkopf's announcement was made before the Coalition commenced its major 'bridge-busting' effort on February 5/6. From February 10, RAF Buccaneer and Tornado aircraft were primarily tasked with bridge strikes. By February 15, 27 of Iraq's 36 bridges on its main transport routes had been destroyed; a further 8 were destroyed by the end of the war. The difficulty of destroying these targets is illustrated by the RAF estimate that 24 strikes were required on average to destroy a bridge. [73]

The effectiveness of strikes on logistic links was amplified by the Iraqi practice of not distributing large quantities of ammunition to individual units, to decrease the possibility of rebellion. This led to wasteful duplications in the re-supply chain and increased the vulnerability of transport trucks to air attack. [74] The J-STARS aircraft enabled CENTCOM to develop a detailed map of the Iraqi logistical network which forced a reduction in the size of re-supply convoys. [75] By the commencement of Desert Sword, "the Iraqi supply system had ceased to function in any meaningful fashion". [76]

B-52 bombers conducted 1,624 sorties and dropped 25,700 tons of munitions - 29 per cent of the total air ordnance expended during the war. [77] The effectiveness of these raids appears to have correlated with the progress of the interdiction campaign against Iraqi LOCs - as food supplies

decreased the psychological effects of the B-52 strikes were progressively amplified. [78]

While the B-52s success in breaking Iraqi morale has been widely acknowledged, their effectiveness was significantly enhanced by the concentration and particularly the immobility of Iraqi troops. The extent to which its stasis made the Iraqi Army uniquely vulnerable to B-52 strikes is a factor to bear heavily in mind when claims such as Arkin's that 'massive amounts of bombs are needed to win a war' are considered.

As it was, the success of strikes by ground attack aircraft with PGMs may have had an equally deleterious effect on Iraqi morale as B-52 strikes. Iraqi soldiers, observing the destruction of individual vehicles with PGMs, may have "rapidly concluded that the safest course of action was to separate themselves from their tanks and armoured personnel carriers". [79]

While B-52 missions benefited greatly from Iraqi immobility, lower altitude strikes with PGMs and other ordnance made any sizeable movement by Iraqi forces an extremely dangerous proposition. For instance, on 22 January 2 A-10s and an AC-130 were directed by a J-STARS aircraft to an Iraqi column of about 71 vehicles; the BAI aircraft destroyed 58 of these vehicles. This convoy may have been involved with preparations for the attack on the Saudi border town of Khafji on January 29. [80]

BAI missions were also assisted by the environmental conditions of the KTO. For instance, the temperature differences between Iraqi armoured vehicles and their revetments meant that these vehicles were readily detectable early in the night or morning, by aircraft equipped with infra-red-seeking target acquisition systems. [81]

Saddam's brief departure from a defensive strategy with the Khafji attack almost certainly indicates his anxiety with the way the war was proceeding even at that relatively early stage. While an Iraqi brigade occupied Khafji for two days, the Iraqi Army's vulnerability, without air support, to air attack was highlighted in this battle. Between 2 and 3 Iraqi divisions, which should have constituted the main attack force, were caught by air-strikes on their start-lines and forced to retreat. [82]

While the Iraqi Army was not able to generally compensate for the absence of aerial support, it demonstrated a high degree of defensive tactical skill in some areas. Iraqi soldiers proved adept at communications interception, and this provided timely warning of imminent Coalition ground-attack aircraft strikes. [83]

These interceptions also assisted an improvised combination of radar-guided SA-8 SAMs with infra-red SA-9 or 16 SAMs which "laid ambush" to low-flying ground-attack aircraft. Observation of Coalition tactics, involving a hard left or right turn to break the lock of the SA-8s, led to the Iraqis deploying their infra-red missiles at right-angles to the SA-8s. When Coalition pilots made their turns, they offered "a big heat plume" from engine exhausts to the infra-red missiles. [84]

As discussed in Chapter 2, the timing of Desert Sword was the most critical issue facing CENTCOM, and its intelligence difficulties were the most critical issue in determining this timing. Bomb damage assessment was "as much an art as a science". [85]

CENTCOM compiled its estimates of bomb damage by including about 50 per cent of the apparent kills shown in aircraft videos, one third of the claims of A-10 pilots (which were

judged more reliable because the A-10s could linger over the battlefield) and all the damage able to be confirmed by high resolution imagery. These estimates were disputed by the USAF as too conservative and by the CIA, which only accepted satellite imagery, as too optimistic. [86]

By the start of Desert Sword, CENTCOM estimated that the Iraqi Army had lost 38 per cent of the tanks, 32 per cent of the armoured personnel carriers, and 45 per cent of the artillery with which it began the war. CENTCOM further estimated that losses were higher among front-line units. The CIA estimated at that point that only 10 to 15 per cent of Iraqi assets had been destroyed. [87]

The precise extent to which the air campaign had degraded the Iraqi Army's capabilities remains uncertain. However, CENTCOM's estimates were deliberately conservative, to avoid a repeat of the exaggerated claims of Communist losses that were made in the Vietnam War.

As noted, by mid-February prisoner of war interrogations were providing additional evidence to CENTCOM of severe hardships among front-line units, including the failure of resupply and summary executions of deserting soldiers by the Republican Guard. CENTCOM may also have received intelligence on the state of the Iraqi Army from Special Forces teams inserted close to Iraqi units. [88]

CENTCOM was concerned that its ground forces would be vulnerable to chemical and artillery attacks in their initial penetrations of the Saddam Line. Accordingly, as G-day for Desert Sword, February 24, approached, CENTCOM allocated more sorties for battlefield-preparation and breaching operations. [89] CENTCOM required the elimination of 90 per cent of the Iraqi artillery covering breach-points. Special weapons, including heavy kinetic energy

bombs and Fuel-Air Explosives, were used to collapse Iraqi dug-outs and detonate minefields. [90]

The Coalition's CAS effort during Desert Sword was very intensive - more than 1,400 CAS sorties were flown on both February 25 and 26 alone. However, the rapid disintegration of Iraqi resistance during Desert Sword meant that the Coalition's aerial means were perceived to be fast out-pacing the remaining worthwhile military ends.

This perception contributed very significantly to the timing of the cease-fire. On February 25 USAF Brigadier General Glosson, CENTCOM's chief air operations planner, was alerted by an intelligence source in Kuwait City that the Iraqis were "packing up". An Iraqi column of around 1,000 vehicles was detected by J-STARS aircraft two hours later retreating towards Basra. [91]

Glosson ordered an F-15E strike which blocked the convoy at both ends on February 26. The Mutla Pass choke-point prevented Iraqi vehicles from dispersing. The convoy was repeatedly attacked by US aircraft, and the US Army's Tiger Brigade, later that day. [92] USN and USMC aircraft participating in these attacks were "restricted only by the rate at which the carrier lifts could bring ordnance to the flight deck". [93]

The Bush Administration became quickly concerned with the effects of these attacks on public opinion. On February 27 General Powell advised President Bush that the Coalition's military objectives had been accomplished, and the President approved a cease-fire scheduled for 8am on February 28. [94]

The timing of the cease-fire was later heavily criticised. US forces were halted just short of 2 roads north of Basra. The closure of these roads would have prevented the retreat

of 2 Republican Guard divisions with their heavy equipment. These units subsequently suppressed the Shi'ite revolt in the Basra region in March-April 1991, and thus ensured Saddam's survival. [95] Moreover, General McPeak observed that the Mutla Pass incident was quite legitimate in military terms, for the best time to attack an enemy is when it is in a disorganised retreat. [96]

The air campaign was designed to rapidly destroy the Iraqi armed forces, and to minimise Coalition casualties. It achieved these objectives, but the war was ended partly in recognition of the political costs which might arise from a too vivid display of modern air power's destructive capabilities.

An indication of the scale of the air campaign, and the magnitude of Iraq's defeat, is provided by a number of statistics.

Coalition aircraft expended approximately 88,500 tons of ordnance during the Gulf War. This represented an average 'monthly' bomb tonnage of 40,416 tons. By comparison United States aircraft expended a monthly average of 44,014 tons in the Vietnam War, and Allied aircraft a monthly average of 47,777 tons in World War II. [97]

The monthly average for the Gulf War is of a comparable magnitude to that of the earlier conflicts. However the intensity of the Coalition air effort is emphasised when other factors are considered. These include technological advances that permitted smaller ratios of bomb tonnage to targets destroyed; the fact that the Gulf War only lasted 6 weeks, so that an intense air effort had to be maintained from the outset in order to produce a monthly average

comparable to that of the earlier conflicts; and the maintenance of this average despite the cancellation of many missions because of bad weather and, later, smoke from oil well fires ignited by the Iraqis.

United States' aircraft flew approximately 73 per cent of the total 109,867 Coalition sorties. Approximately 50 per cent of Coalition sorties were flown by the USAF; 16 per cent by the USN and 7 per cent by the USMC. [98]

Coalition casualties included 148 US troops, and 191 troops from other nations, killed in action. The great disparity between the military means of the two sides is shown by the fact that approximately 25 per cent of US casualties, and 50 per cent of UK casualties, were from 'friendly fire'.

Freedman and Karsh have derived a best estimate of 35,000 Iraqi soldiers killed in both the air and ground phases of the war. An official Iraqi source estimated that 2,278 Iraqi civilians were killed in the war. According to US Defense Intelligence Agency and Greenpeace data, a further 100,000-120,000 civilian deaths can be attributed to war-related ailments (including the collapse of Iraqi public health services after the war), and the Iraqi civil unrest in March-April 1991. [99]

In January 1992, Iraq was estimated to have retained 703 tanks, 1,430 armoured personnel carriers and 340 artillery pieces - representing respectively 15 per cent, 50 per cent and 10 per cent of the pre-war Iraqi inventory of these weapons. [100]

NOTES

[1] Waters, op cit, p.124.

[2] Freedman & Karsh, op cit, p.287.

[3] Ibid, p.302

[4] Ibid.

[5] Waters, op cit, p.124.

[6] Freedman & Karsh, op cit, p.319.

[7] Ibid. p.329

[8] Freedman & Karsh, op cit, p.322.

[9] D.A. Fulghum, 'US weighs use of non-lethal weapons in Serbia', AWST
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[10] Freedman & Karsh, op cit, p.322.

[11] R. Sibbald in Pimlott & Badsey, op cit, p.257.

[12] J.D. Morrocco, 'Allied strategists altered battle plans to
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[13] Mason, op cit, p.215.

[14] D.A. Fulghum (B), 'F-117 pilots, generals tell Congress about
stealth's value in Gulf War', AWST, 6/5/91, p.66.

[15] US Department of Defense, op. cit., p.4-16.

[16] M.A. Dornheim, 'F-117A pilots conduct precision bombing in high threat environment', AWST, 22/4/91, p.51.

[17] Nordwall, op cit, p.69.

[18] W.B. Scott, 'Triangular recon aircraft may be supporting F-117A', AWST, 10/6/91, p.20.

[19] Waters, op cit, p.101.

[20] Freedman & Karsh, op cit, p.313.

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[24] Ibid, p.187.

[25] Ibid.

[26] R. Sibbald in Pimlott & Badsey op cit, p.115.

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[29] Fulghum, op cit, p.21

[30] Ibid.

[31] J. Lenorovitz, 'Air National Guard pilots say small arms fire is primary threat', AWST, New York, 25/2/91, pp.42-43.

- [32] D.A. Fulghum, 'Allies feared massive Iraqi nonconventional attack', AWST, New York, 2/7/91, p.61.
- [33] Kopp, op cit, p.34.
- [34] Gregory, op cit, p.10
- [35] Mason, op cit, p.218.
- [36] Freedman & Karsh, op cit, p.304.
- [37] Ibid.
- [38] T. Nash, 'Tornado airfield denial operation', Military Technology, Bonn, February 1991, pp.87-88.
- [39] Braybrook, op cit, p.56.
- [40] Freedman & Karsh, op cit, p.315.
- [41] Ball, op cit, p.79.
- [42] US Department of Defense, op cit, pp. 2-5.
- [43] Ball, op cit, p.81
- [44] US News and World Report, op cit, pp.3-6
- [45] D.A. Fulghum, 'Allies feared massive Iraqi nonconventional attack', AWST, New York, 22/7/91, p.61.
- [46] Ball, op cit, p.79.
- [47] Heikal, op cit, p.401.

[48] Ball, op cit, p.

[49] Freedman & Karsh, op cit, p.324.

[50] Ibid, p.332.

[51] Ibid, p.333

[52] Ibid, p.334

[53] Ibid, p.335

[54] US Department of Defense, op cit, p.4-4

[55] Freedman & Karsh, op cit, p.308.

[56] S McKnight, in Pimlott & Badsey, op cit, p.177.

[57] Freedman & Karsh, op cit, p.257.

[58] Ibid, p.398.

[59] D.A. Fulghum (B), 'F-117 pilots, generals tell Congress about stealth's value in Gulf War', AWST, 6/5/91, p.66.

[60] Freedman & Karsh, op cit, p.319.

[61] Pimlott & Badsey, op cit, p.271.

[62] Freedman & Karsh, op cit, p.320.

[63] Ibid, pp.320-321.

[64] Waters, op cit, p.205.

[65] Mason, op cit, p.213.

[66] Braybrook, op cit, p.60.

[67] M. McKinley in I. Bickerton & M. Pearson, 43 Days the Gulf War, Melbourne, 1991, p.187.

[68] Gregory, op cit, pp.15-16.

[69] US Department of Defense, op cit, p.4-5

[70] Freedman & Karsh, op cit, p.372.

[71] Ibid

[72] Ibid, p.370.

[73] R. Sibbald, in Pimlott & Badsey, op cit, p.117.

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[84] Ibid.

[85] Freedman & Karsh, op cit, p.369.

[86] Ibid.

[87] J.D. Morrocco, 'Soviet peace plan weighed as Gulf ground war looms', AWST, New York, 25/2/91, pp.21-22.

[88] Waters, op cit, p.105.

[89] US Department of Defense, op cit, p,4-5.

[90] Braybrook, op cit, p.60.

[91] D. Waller & J. Barry, 'The day Bush stopped the war', Newsweek, Sydney, (published in The Bulletin, 21/1/92, pp.50-51.

[92] Ibid, p.53.

[93] Braybrook, op cit, p.60

[94] Waller and Barry, op cit, p.57

[95] Ibid.

[96] Freedman & Karsh, op cit, p.403.

[97] Waters, op cit, p.163.

[98] AWST, 22/4/91, p.43.

[99] 'Tactical value of bombing Iraqi forces outstripped value of strategic hits, analyst contends', AWST, 27/1/92, P.63.

[100] Waller and Barry, op cit, p.48

CHAPTER 4: CONCLUSIONS

The Coalition's air campaign dominated military operations in all but the last 4 days of the Gulf War and achieved strategic results far more quickly, and much more cheaply, than in previous air campaigns of a comparable magnitude.

Although its political vulnerabilities were a major concern, it was highly unlikely that the Coalition would be defeated. Nevertheless, a quick and cheap Coalition victory was by no means certain.

The Coalition's advantages in air power were therefore critical in enabling it to dictate the course of operations and minimise its own casualties. In addition, air power contributed fundamentally to defeating Saddam's attempt to regain the initiative in the Khafji attack and in the suppression of Scud missile strikes, the most dangerous Iraqi initiative in the war.

These successes have been qualified with the observation that the Gulf War did not impose an extreme test on most of the Coalition's military capabilities. In particular, the failure of the IAF to seriously challenge the Coalition enabled CENTCOM to proceed through its campaign plan largely at a pace of its own choosing. The effort to suppress Iraqi Scud strikes represented the one critical exception to this and demonstrated both the advantages and limitations of air power in the Gulf War.

The 'Scud hunt' demonstrated CENTCOM's flexible use of air power in a way that largely overcame the inherent rigidity of its own mission tasking system. However, the Scud strikes were not eliminated until the Coalition had defeated Iraq on the ground.

The events of the Gulf War do not support the claim that the strategic aspects of the air campaign were an unnecessary effort. However, where critics such as Arkin are on firmer ground is in regard to the strategic justification for the scale of attacks on some target sets, such as electrical power facilities. Conversely, other target sets, such as nuclear research facilities, were not targeted as comprehensively as CENTCOM's objectives required. Both these cases also reflect more general intelligence shortfalls which led to duplicative strikes, or no strikes at all, against particular targets.

Most of the 'new' technology employed in the Gulf War performed well. That the accuracy of specific munitions has been re-evaluated from the 90 per cent success rates initially claimed down to a level of 60 per cent or so is not surprising. The lower rates are after all more consistent with peacetime range scores. However, while the demonstrated *potential* of PGMs to destroy a target with a single 'shot' was well advertised by CENTCOM, a more significant feature of the air campaign was the sustainment of a level of strikes which ensured particular targets were destroyed with these munitions.

Many Iraqi targets sets, including the IADS and bridge targets discussed in Chapter 3, required a significant effort to destroy them, even with accurate PGMs. The Coalition's ability to sustain this effort through a very high sortie rate was therefore one of the most critical aspects of its operations; in this respect the major achievements of the air campaign rested on the Coalition's logistical capabilities. These, as with many other capabilities, were several orders of magnitude above those of Iraq.

Iraq was not a technologically backward opponent, but the Coalition had access to technological assets which either in degree or kind were not available to Iraq. The F-117A stealth aircraft, in particular, received great acclaim although its performance has, as noted, been qualified by critics who have emphasised the support provided to their early missions by EW aircraft. However, the F-117A's stealth characteristics amplified this support.

Stealth aircraft are a continuation of the contest between electronic detection and intrusion which began before the Second World War. While there is evidence of the emergence of effective countervailing detection technologies, the F-117As showed that an aircraft whose stealthiness is totally disproportionate to a defender's detection capabilities can prove very effective indeed, and it is highly probable that stealth technology will form a major element of future developments in air power.

The air war in the Gulf did not demonstrate the strategic primacy of air power over other forms of military force. It did, however, demonstrate that, when linked to achievable objectives, air campaigns can contribute decisively to the outcome of conflicts, and that the effectiveness of this contribution is a product of factors equally applicable to other forms of military force, especially good command and control and intelligence. These demonstrations may ultimately prove more useful than assertions that air power 'won' the Gulf War.

As discussed at the outset of this thesis, any attempt to distil the implications of the Gulf War for future conflicts is very difficult. The air campaign will influence future developments, but the specific relevance of this influence is uncertain. The air war in the Gulf demonstrated the fundamental importance of air power in a conventional war.

However, in underlining both the vulnerability of a large military establishment to air attack, and the cost of deploying a force sufficient to exploit this vulnerability, the Gulf War may foreshadow the decreasing utility of large military operations.

In this respect the Scud-offensive, involving smaller and more elusive Iraqi units, and the Coalition response to it, may foreshadow aspects of both the nature and difficulties of future conflicts.

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